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THE FACULTY OF EDUCATION

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GLOBAL SURVEILLANCE OF BREATHING COMPLICATIONS (ASTHMA PREVALENCE AND SEVERITY IN YAOUNDE, CAMEROON): RELATION TO ENVIRONMENTAL RISK FACTORS.

A research project written and presented for partial evaluation in view of obtaining a

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By:

Elvis NDIKUM ACHIRI

16R3247

Bachelor's Degree in Animal and Physiology Biology

Supervisor:

Gideon AJEAGAH AGAINDUM

Professor



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CERTIFICATION

This is to certify that this research project with the title: “**Global surveillance of breathing complications (Asthma prevalence and severity in Yaounde, Cameroon): Relation to environmental risk factors**” was written by **Elvis NDIKUM ACHIRI** (16R3247) from the department of Specialized Education, Faculty of Education, University of Yaounde I. I am solely responsible for any shortcomings that might be found in this work.

Supervisor

Pr. Gideon AJEAGAH AGAINDUM

Date

DEDICATION

To my mother Marie NGUM ACHIRI for her endless zeal to educate me.

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LIST OF ABBREVIATIONS AND ACCRONYMS

BMI	: Body Mass Index
GINA	: Global Initiative for Asthma
CI	: Confidence Intervals
EQ	: Environmental Questionnaire
GAN	: Global Asthma Network
ISAAC	: International Study of Asthma and Allergies in Childhood
NCDs	: Non Communicable Diseases
OR	: Odds Ratio
COPD	: Chronic Obstructive Pulmonary Disease
SES	: Socio Economic Status
THE UNION	: The International Union against Tuberculosis and Lung Disease
WHO	: World Health Organization
LABA	: Long-Acting Beta Agonist
SABA	: Short-Acting Beta-Agonist
DALY	: Disability Adjusted Life Years
YLL	: Years of Life lost
YLD	: Years Lived with Disability
ADBRTHEV	: Trouble with wheezing ever or current
NWHEZ12	: Wheezing attacks in last 12 months
AWAKE12	: Sleep disturbed in last 12 months
ADBRTHLS	: Breathless when wheezing noise was present
ADWOKE12	: Sleep disturbed due to shortness of breath in last 12 months
SPEECH12	: Severe wheeze in last 12 months
ASTHMAEV	: Asthma ever
ASTHDOC	: Asthma confirmed by doctor
ASTHPLAN	: Written asthma plan
ASTHMA12	: Attack of asthma in last 12 months
MEDPUFF	: Medicine Used
FEV	: Forced Expiratory Volume
ATS	: American Thoracic Society
ERS	: European Respiratory Society

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ABSTRACT

This memoir entitled: “Global surveillance of breathing complications (Asthma prevalence and severity in Yaounde, Cameroon): Relation to environmental risk factors”, focused on psychosocial, biological and socio-economic risk factors which are inevitably to cause complex breathing problems like asthma episodes and other diseases. According to the World Health Organization, through birth, adolescence and beyond, air pollution principally driven by fossil fuels, and exacerbated by climate change damages the lungs and every other vital organ. Our study strived to explore the relationship that exist between environmental risk factors and the rise in the prevalence and severity of asthma episodes among children, adolescents and adults in Yaounde, Cameroon. We used a mixed method research study and conducted a cross sectional data through passive consent within (27) primary and (22) secondary schools in the Mfoundi Division, Yaounde Cameroon’s capital city area from November 2018 to May 2019. Quantitative and qualitative data was collected through parents, guardians of children and adolescents in schools. We measured the weight, height of children and adolescents, and video watched on respiratory problems by adolescents. The key components of questionnaire being; surveillance; asthma management; confirmation by doctor diagnosed asthma, socioeconomic status; early life environment; potential risk factors in the environment; home environment; and smoking. The results from our study conducted among 722 children, 1066 adolescents and 860 adults in Yaounde revealed that: the prevalence of self-reported asthma at 3,6%(n=2648) respondents, with 1,8%, 5,3% and 3% in children, adolescents and adults, respectively. In our study, there was a strong correlation highlighted between tobacco smoking, poor quality of life and poor asthma control. The prevalence of shisha or water pipe smoked at home doubled among adolescents with 4,8% currently smoking. There was a strong association of wheezing symptoms in the last 12 months and risk factor for asthma. In our study, age and sex emerged as an aggravating factor or having an impact on the respiratory pathology. The prevalence was higher among adolescents than in adults and children respectively. In our study there was a relationship between body mass index and risk of symptoms of asthma, especially with significant number of overweight children and adolescents. The results from the research hypotheses led us to conclude that; asthma affects all age groups with more cases noticed among adolescents, followed by adults then children. This confirms association to increasing environmental risk factors such as air pollution, but also underdiagnoses among adolescents which could be resolved by more community education, awareness and advocacy on the need for early screening before adolescent age. Given that asthma could be of biological (genetic), but also causal factors such as psycho-social and socio-economic risk factors.

Key words: Asthma, environmental risk factors, children, adolescents, adults, prevalence, and severity.

RÉSUMÉ

Ce mémoire intitulé : « Surveillance Mondiale des complications respiratoires (Prévalence et gravité d'asthme à Yaoundé, Cameroun) : Relation avec les facteurs de risques environnementaux » était axé sur les facteurs de risque psycho-sociaux, biologiques et socio-économiques qui de manière inévitable sont à l'origine de problèmes respiratoires complexes tels que des épisodes d'asthme et d'autres maladie. Selon l'Organisation Mondiale de la Santé, de la naissance à l'adolescence et au-delà, la pollution de l'air principalement due aux fossiles et exacerbée par le changement climatique, endommage les poumons, le cœur et tous les autres organes vitaux. Nous avons utilisé une méthode d'étude de recherche mixte et mené une collecte de données transversale par consentement passif dans (vingt-sept) écoles primaires et (vingt-deux) écoles secondaires des sept arrondissements du département du Mfoundi de la ville de Yaoundé, de Novembre 2018 à Mai 2019. Des données quantitatives et qualitatives ont été collectées auprès des parents, tuteurs d'enfants et adolescents dans les écoles. Nous avons mesuré le poids, la taille des enfants et des adolescents et le visionnage d'une vidéo par les adolescents sur les problèmes respiratoires ont été un aspect essentiel de notre étude. Les éléments clés du questionnaire étant : surveillance ; gestion de l'asthme ; confirmation par le médecin du diagnostic de l'asthme ; statut socioéconomique : environnement de la petite enfance ; facteurs de risques potentiels dans l'environnement ; environnement domestique ; et le fait de fumer. Les résultats de notre étude menée auprès de sept cent vingt-deux enfants, mille soixante-six adolescents et huit cent soixante adultes avec un total de deux mille six cent quarante-huit participants impliqués à Yaoundé ont révélé que, la prévalence de l'asthme était d'environ 3,6% sur un nombre total de personnes deux mille six cent quarante-huit, 1,8% chez les enfants, 5,3% chez les adolescents et 3% chez les adultes. Dans notre étude, une forte corrélation a été mise en évidence entre le tabagisme, une mauvaise qualité de vie et un mauvais contrôle de l'asthme. La prévalence de la chicha ou de la pipe à eau fumée à la maison a doublé chez les adolescents avec 4,8% de fumeurs. Il y avait une forte association entre les symptômes de respiration sifflante au cours des douze derniers mois et le facteur de risque d'asthme. Dans notre étude, l'âge et le sexe sont apparus comme un facteur aggravant ou ayant un impact sur la pathologie respiratoire. La prévalence était plus élevée chez les adolescents que chez les adultes et les enfants respectivement. Dans notre étude, il y avait une relation entre l'indice de masse corporelle et le risque de symptômes d'asthme, en particulier avec un nombre important d'enfants et d'adolescents en surpoids. Les résultats des hypothèses de recherche nous ont amenés à conclure que : l'asthme affecte toutes les tranches d'âges avec plus de cas observés chez les adolescents, suivis des adultes puis des enfants. Cela confirme l'association avec l'augmentation des facteurs de risque environnementaux comme la pollution de l'air, mais aussi les sous-diagnostic chez les adolescents qui pourraient être résolus par l'éducation communautaire, une plus grande sensibilisation et un plaidoyer sur la nécessité d'un dépistage précoce avant l'âge de l'adolescence. Etant donné que l'asthme pourrait être d'origine biologique (génétique), mais aussi de facteurs causals tels que des facteurs de risque psycho-sociaux et socio-économiques.

Mots clés : Asthme, facteurs de risque environnementaux, enfants, adolescents, adultes, prévalence, gravité.

GENERAL INTRODUCTION

In 2019, the world was hit by the worst breathing problem of this century (the coronavirus). The World Health Organization Independent Panel for Pandemic Preparedness and Response with mission to better understand the origins of this deadly virus which reported on 20 March, 2021. Several health facilities in China reported clusters of a pneumonia of unknown origin. As patients did not respond to typical pneumonia treatments, clinicians became concerned that the illness might be something new and sent samples to laboratories for evaluation. The pathogen turned out to be a new coronavirus (Ellen *et al.*, 2021).

The importance of understanding the consequences of environmental risk factors on breathing (asthma) and health is highlighted by the urgency and severity of this threat. The COVID-19 pandemic has made it clear that we can no longer separate human health from ecosystems and animal health. On 30 December 2019, the Wuhan Health Commission issued two urgent notices to hospital networks in the city about cases of pneumonia of unknown origin. Discovering what was causing the cases and how it might be transmitted was an urgent concern. While a majority of the people with confirmed cases had attended the Huanan Seafood Market, a substantial minority had not, raising the question of which common factor was causing their illness, including the possibility of human-to-human transmission.

In an asthma attack, bronchospasm plays an important role in tightening of the muscles that line the airways (bronchi) in the lungs. When these muscles tighten, the airways narrow. As the bronchial musculature is innervated by the autonomic nervous system, it is logical that psychic factors can influence its tone. Vagal stimuli directly cause bronchoconstriction. 100 years ago, asthma was considered a crisis of psychic etiology and therefore was also called asthma nervosa. The allergic reaction had not yet been discovered and the relationship between allergen exposure and bronchial reaction in allergic asthma was therefore not known either. Psyche and asthma have remained relevant for the past hundred years, even though their relationships have been interpreted and judged in very different ways. It is more and more accepted today that certain psychic factors are likely to influence somatic health, a finding already registered in Hippocratic medicine where for the latter the separation of body and psyche was artificial. In this context, several somatic pathologies are studied in their relation to the environment, to the context of onset and aggravation or in relation to the mental states and emotions of the patient (Thomas, 2010).

Severe psychosocial stresses can have a significant influence on the response to treatment and the course of asthma. Anxiety and depression especially are factors that often have a negative influence on medication adherence. Anxious hyperventilation can stimulate and worsen asthmatic symptoms. Conditioning, suggestion and the placebo effect are factors in asthma as

well. Asthma, like smoking, air pollution and other risk factors are worrying phenomena because they are responsible for a high annual death rate.

Since ages, the prenatal and postnatal breathing conditions of every child and adult are influenced not only by biological preexisting health conditions, psycho-social, but also by the environment they are exposed to. In effect, the mother shares much with the child before and after birth. Before birth, the environmental surroundings and quality of air the parents of a child breathe especially the mother will determine the outcome of the child's breathe beyond childhood. Even though you cannot see it, the air you breathe can affect your health. Polluted air can cause difficulty breathing, flare-ups of allergy or asthma (A chronic lung disease that causes wheezing, coughing, chest tightness and trouble breathing.), and other lung problems. Considering the negative impacts related to short term exposure to air pollution, the long-term exposure can raise the risk of other diseases, including heart disease and cancer (Nadia, 2018).

While some people think of air pollution as something that is found mainly outside. They may picture cars idling, dust from unpaved roads, waste burning or power plants with smoke stacks. But air pollution can also occur inside-in homes, offices, healthcare facilities, or even schools. Whether outdoors or indoors, the effects of air pollution are most obvious for those who already have difficulty breathing. All people are likely susceptible to the adverse effects of air pollution. But people who have chronic lung diseases such as asthma are more susceptible. Outside our homes there are several types of pollutants that can affect our health outdoors. When the weather is warm, an invisible gas called ozone can make it harder for some people to breathe. This gas is created when sunlight triggers a chemical reaction between oxygen and certain pollutants from cars, factories, and other sources. Ozone can irritate the lining of the airways and lungs. People with asthma and other lung conditions are more likely to feel its effects. When people with poorly controlled asthma are exposed to low levels of ozone, the amount of inflammation (Swelling, redness, or irritation caused by the body's protective response to injury or infection.) in the lungs goes way up; As a result, air passages narrow, which makes it much harder to breathe (Darryl, 2018).

Inside our homes we identify indoor air pollutants which are harmful as well as outdoor pollution. It can come from many sources. The burning of biomass solid fuels or firewood and kerosene stoves for cooking, secondhand tobacco smoke contains tiny particles that can hurt the lungs. Gas stoves and appliances can create harmful gases. Pets and pests (such as mice and cockroaches) can shed substances, called allergens that cause allergies. Mold and dust mites also produce allergens. Even furniture and cleaning products can release harmful compounds into the air. According to the World Health Organizations study findings, 90% of world's children are

breathing toxic air and 99% of populations live in areas where air pollution levels are far above the World Health Organization Air Quality standards. Recent studies suggest poor air quality affects our psychology, reducing our level of trust in others and creating fewer positive emotions than clear skies (Hou *et al.*, 2021).

The main objective of our study was to explore the relationship that exist between environmental risk factors and the rise in prevalence and severity of asthma episodes among children, adolescents and adults in Yaounde, Cameroon. From our main objective, we have derived three specific objectives which are aligning with our specific questions and our research hypothesis which are; The first specific objective was to identify the symptoms associated to asthma episodes in Yaounde. The symptoms of breathing complications such as asthma among children, adolescents and adults. It is expected that symptoms such as trouble with wheezing ever or current, wheezing attacks in the last 12 months, sleep disturbed in the last 12 months, breathing when wheezing noise was present, severe wheeze in the last 12 months will confirm presence of asthma episodes and worsen quality of life. The second specific objective is to explore the relationship that exist between environmental risk factors and the rise in prevalence and severity of asthma episodes among children, adolescents and adults in Yaounde. It is expected that psycho-social, biological and environmental risk factors such as tobacco smoke, genetics, body mass index, firewood burning, truck traffic and more will cause asthma episodes or worsen conditions of asthmatics. The third specific objective was to evaluate asthma management among children, adolescents and adults in Yaounde. It is expected that management of asthma episodes will be associated to school absence, work absence and hospitalization.

This memoir comprises of two parts which are the theoretical context of study and the second being materials and methods. The first part made of three chapters; chapter one on the problem of our study, the concepts of anxiety and depression are also explored, chapter two being literature review associated to previous studies on the etiology of asthma and environmental risk factors, and chapter three on asthma psychosomatic theories with related authors. Part two on methodology is also made up of three chapters which are; chapter four on materials and methods, chapter five on the presentation of results collected on the field and analyzed by Global Asthma Network Centre in London, and chapter six on discussion and interpretation from literature, results as well as different theories. Then we concluded our work based on our specific objectives, then limitations, recommendations and perspectives.

PART 1:
THEORETICAL CONTEXT OF STUDY

CHAPTER 1: STUDY OF PROBLEM

Introduction

According to the Forum of International Respiratory Societies, there is an immense worldwide health burden caused by respiratory diseases. It is estimated that 235 million people suffer from asthma. Breathing challenges are a painful reality for those suffering from lung disease such as asthma, which affects people of all ages in every corner of the world. This can be justified by the fact that, when we are healthy, we take our breathing for granted, never fully appreciating that our lungs are essential organs for life.

The lung is the most vital and the most vulnerable organ than any organ. Being unable to breathe is one of the most distressing feelings one can have. The lungs are also the largest internal organ in the body and the only internal organ that is exposed constantly to the external environment. Everyone who breathes is vulnerable to the infectious and toxic agents in the air. Respiratory diseases are known to cause death in all regions of the globe and in all social classes, certain people are more vulnerable to environmental exposures than others. According to the latest World Health Organization data published in 2018, asthma deaths in Cameroon reached 1,258 or 0,6% of total deaths. The adjusted Death Rate is 10,86 per 100,000 of population ranks Cameroon number 48 in the world.

1-1 Asthma

The interplay between conditioning, anxiety, autonomic nervous system and acute dyspnea mainly concerns the asthma attack, currently considered only as an epiphenomenon of the disease. Even acute exacerbations are rather rarely of a purely psychic nature. Prospective studies have shown that up to 80% of acute asthmatic exacerbations are triggered by viral upper respiratory tract infections. Other triggers for acute dyspnea are: Allergic contact, physical exertion and non-specific irritation of the respiratory tract from smoke and cold air (Thomas, 2010).

1-1-1 Definition of asthma

According to the Global Initiative for Asthma guidelines, asthma is defined as a chronic inflammation and hypersensitivity of the airways. The bronchi can be obstructed by spasm of their musculature, viscous secretions and inflammatory edema of the bronchial mucosa, which causes a decrease in respiratory flow. An anxiety attack can cause an instant emptying of the intestine: "having the shit". Asthma attack is not a defining criterion because in many cases it is a slowly progressive obstruction that appears, without necessarily having an acute attack of dyspnea. According to (Turner-Warwick, 1977), we then speak of asthma of the "derivative"

type, characterized by a slow drop in peak-flow values, without significant reversibility to betastimulants.

Population living in urban areas are expected to rise from 45% to 59%, which suggests a significant increase in the number of people with asthma, suggesting that there could be up to 100 million more asthmatics (Masoli *et al.*, 2004). Moreover, asthma is a heterogeneous disease on many facets: clinical, psychological, medical, phenotypic, etc. (Didier *et al.*, 2010). Indeed, there is not a typical model of the asthmatic patient, but suffering individuals. The variety and multiplicity of pathology, treatments and health beliefs lead us to consider the importance of care adapted to each person, according to their needs and resources, as well as the necessary interdisciplinary of looks to think about a better adaptation to care. The contribution of health psychology in this field would allow us to better understand the health behaviors of patients as well as the impact of emotions on such a pathology.

1-1-2- Different types of asthma

There are four different levels of severity in asthma. This ranking is proposed by The Global Initiative for Asthma (GINA), a global initiative that collaborates worldwide with professionals and public health organizations. At level 1, the person with asthma is bothered less than once a week. At level 2, the patient is embarrassed at least once a week and requires background therapy with inhaled corticosteroids as well as a rapid-acting bronchodilator on demand, in case of exacerbation. When the patient is bothered by his asthma on a daily basis, this corresponds at level 3. The treatment is then more important and the corticosteroids must be inhaled at a higher dose. Finally, level 4 corresponds to severe asthma, the reinforced treatment of which requires greater monitoring to follow the evolution of the pathology (Magnan, 2009).

Severe asthma affects 5 to 10% of asthmatics in France (Bouée *et al.*, 2018). It is defined by the international (American Thoracic Society / European Respiratory Society) consensus as an asthma requiring substantial treatment (high doses of inhaled corticosteroids in combination with another treatment, or oral corticosteroid therapy) in order to maintain control or which remains uncontrolled despite this treatment (Chung *et al.*, 2014). In addition, (American Thoracic Society / European Respiratory Society) recommendations consider asthma to be severe in a person over six years of age whose asthma required The Global Initiative for Asthma level 4 treatment. An appropriate multi-step approach is necessary for the diagnosis of severe asthma (Begne and Magnan, 2015).

An epidemiological description of 1465 adult severe asthma patients (according to ATS / ERS criteria) treated in general hospital centers in France. Personal atopy is present in 66% of patients and familial atopy in 39% (Portel *et al.*, 2018). Asthma started before the age of 12 for

34% of patients. Indeed, there is a link between the severity and duration of asthma: the more severe the asthma, the more it tends to persist. Severe asthma occurs for many causes, among them a high rate of sensitization to pneumoallergens, between 43 and 76% (Perotin, 2016).

1-1-2-1- Severe acute asthma

Asthma can be complicated by an unusual attack that can be life-threatening (Tual *et al.*, 2008), this is called severe acute asthma (Saulnier *et al.*, 2008). The way in which this severe acute asthma is installed is decisive to take into account for its support. We can then distinguish; Super acute severe acute asthma which can lead to death in less than an hour without warning signs. Acute severe acute asthma similar to the previous one, but announced by warning signs the previous days or hours. The subacute severe acute asthma formerly called "asthma attack" characterized by an instability of the disease with one or more days of increasingly serious and frequent attacks, causing a decrease in the sensitivity to the treatments and exposes the patient at any time at a risk of exhaustion. More "banal" asthma attack, the severity of which is not intrinsic, but linked to the circumstances in which the attack occurs: chronic respiratory failure, heart disease, pregnancy, etc.) (Saulnier *et al.*, 2012a):

Severe acute asthma may be linked to a chronic inflammatory process or to a transient acute contraction of the bronchial muscles (Saulnier and Préau, 2012). Hospitalization for severe acute asthma is almost always necessary. In order to optimize discharge from hospital after a crisis, the international consensual recommendations (Global Initiative for Asthma) recommend the identification and eradication of risk factors for exacerbation, the implementation of a personalized action plan, appropriate information and rapid access to pneumological structures (Clerc and Lerover, 2015). This type of asthma presents an unstable psychological ground linked to the unexpected or feared onset of the crisis: emotional instability, denial or disregard of symptoms, behavioral disorders which make it difficult to control asthma (Saulnier and Préau, 2012b).

1-2-2-2 Exercise asthma

Exercise asthma refers to the notion of exercise-induced bronchospasm in an asthmatic (Weiler *et al.*, 2007). The diagnosis of exercise-induced asthma is not easy, as it is sometimes found to be the only asthmatic manifestation of a person and makes it difficult to distinguish from athlete's bronchospasm, especially since pathophysiological pathways of exercise asthma and athlete's bronchospasm are in part common.

1-2-2-3- Allergic and non-allergic asthma

The most recent studies on allergic asthma (Perotin, 2016), mentions the most frequent pneumoallergens, including: fungal sensitization (Castanhinha, *et al.*, 2015), the role of dust

mites (Triani, *et al.*, 2015), as well as exposure to pollen (Erbas, *et al.*, 2015). Particularly observed in children, we also find allergic asthma of food origin. Over 25% of children with food allergy have asthma and 4-8% of children with asthma have food allergy (Bird & Burks, 2009). While it is often accepted that asthma is a manifestation of atopy, this is particularly the case in children and seems less evident in adults. There is a distinction for adult asthma sufferers between "extrinsic" asthma, which is allergic asthma and "intrinsic" asthma which is non-allergic. Showing that non-allergic asthma, which is often difficult to control, is not uncommon, is predominantly female and occurs late in menopause (Kwas *et al.*, 2017). They determined the etiology of this type of asthma in a study of 45 non-allergic asthma patients in Tunisia. Asthma is persistent, moderate in 55.5% of cases and severe in 40%. Asthma is controlled for only 35% of patients.

1-1-3- Specificity of asthma according to age and sex

Asthma affects around three hundred million people worldwide and affects all ages, from infants to the elderly (Dutau *et al.*, 2017). Socio-professional characteristics, sex, age, profession are all characteristics that can be taken into account in terms of the probability of developing asthma. Interest in the prevalence of asthma according to socio-professional characteristics from the 2012 health and social protection survey (Riviere *et al.*, 2018). This research shows that the probability of having asthma is all greater in people who are unemployed, have no qualifications, have low incomes, or benefit from complementary universal health coverage. Regarding occupation, sales and personal service employees as well as administrative employees were more likely to have asthma than people in another occupation.

Regarding sex, several studies show that asthma in women is more common, but also more serious and difficult to control than in men. An explanatory hypothesis is that asthma in women has specificities modulated by hormonal life (Jridi *et al.*, 2015). We note, however, that before the age of 10, asthma is more present in boys than in girls, then at puberty, the trend is reversed and asthma is found mainly in women (Moukram *et al.*, 2017). This finding then goes in the direction of a male - female distinction in terms of the prevalence linked to male and female hormones. Interest in the case of allergic asthma and demonstrating the influence of testosterone on the immune system, thus helping to reduce the risk of asthma caused by allergies (Guéry *et al.*, 2017). If asthma is particularly present in the female population, it will be all the more important to monitor it closely in the event of pregnancy (Piette *et al.*, 2009; Godard *et al.*, 2005; Nocent-Ejnaini, 2016).

It is estimated that between 3 and 12% of pregnant women have asthma (Murphy *et al.*, 2006). Asthma does not in itself put the fetus at risk, but the occurrence of an exacerbation during

pregnancy can lead to serious complications for both mother and baby (Nocent-Ejnaini, 2016). If asthma affects women more particularly than men or more certain socio-professional characteristics, it is nonetheless possible that it can affect the entire population from the youngest to the elderly. This disease is multifaceted and has different phenotypes depending on the age of the affected subject (Just, 2013).

There are different forms of asthma in infants (mild virus-induced, severe infectious corticosteroids, etc.) as well as in children (mild monoallergic, severe multiallergic, etc.) depending on its origin and severity. Distinguishing the form of the pathology makes it possible to personalize and target its therapy (Just, 2013). The phenotype of asthma in an elderly subject is specific and characterized by more severe bronchial obstruction, but generally less perceived by the patient (Robitaille *et al.*, 2014). The diagnosis of asthma in the elderly is made difficult because it is often confused with another disease: such as obstructive pulmonary disease (COPD) or with the natural aging of the airways (Radenne *et al.*, 2003).

We can distinguish two asthma clinics for people over 65 years of age: “aged” asthma which corresponds to the evolution of asthma that started in childhood or adolescence and “late” asthma generally occurring in childhood or adolescence. Following a poorly controlled infectious episode (Radenne *et al.*, 2003). Asthma mortality and morbidity rates are higher in people over 65, due to advanced age on the one hand, but also due to the difficulty of diagnosis, the underestimation of severity or inadequate treatment (Robitaille *et al.*, 2014).

1-1-4- Exacerbations

Asthma exacerbations are periods of worsening symptoms that are a red flag for disease control (Lamouroux, 2012). These periods can lead to emergency calls, reflecting poor crisis management, less optimal control, or a misperception of the severity of symptoms (Patridge *et al.*, 2006). Difficult to treat, taking into account exacerbations must nevertheless be at the heart of an adapted care plan, because they are a major factor in mortality (Thomson *et al.*, 2008). The viral infections that are frequently the causes of an exacerbation of asthma, especially rhinoviruses in 40 to 80% of cases (Deschildre *et al.*, 2010). Also, important to highlight other mechanisms responsible for an exacerbation such as allergens, pollution and tobacco, as well as the underlying immunogenetic background of the patient which can induce the inflammations responsible for the exacerbation (Montani *et al.*, 2010).

The Global Initiative for Asthma (GINA) defines exacerbations as "episodes of gradually worsening dyspnea, coughing, wheezing episodes and chest tightness or a combination of some of these symptoms. They are accompanied by a decrease in expiratory flows which can be quantified by functional explorations (DEP, FEV1 - Maximum Expiratory Volume per

Second). The exacerbations are classified into four stages (mild, moderate, severe and imminent respiratory arrest) according to clinical, functional and gasometric criteria”. Table I provides information grouping the clinical criteria for asthmatic exacerbation (Montani *et al.*, 2010)

TABLE I:

Clinical criteria for asthma exacerbation (Montani *et al.*, 2010)

Increased frequency of short-lived symptoms that do not return to normal within 48 hours

Cough

Dyspnea

Chest tightness

Sibilants

Night awakening

Increased use of rapid-acting bronchodilators

Decreased effectiveness of rapid-acting bronchodilators at usual doses

Unscheduled consultations

Consultations in an emergency department

Hospitalization for asthma

An exacerbation is retained in the presence of worsening of clinical and / or functional criteria (PED, FEV1), without return to the baseline state, requiring specific management for at least two days.

1-1-5- Asthma severity and control

Asthma that is difficult to control greatly affects the quality of life on several levels depending on the degree of severity of the pathology. In some cases, asthma can lead to isolation. Almost a third of asthma patients are said to have restricted social lives because of their breathing disability. The European Federation of Allergy and Airway Diseases Patients Association (EFA) shows that 21% of asthma sufferers believe they have missed a professional opportunity because of their asthma (Siroux *et al.*, 2007). Some people with difficult asthma refuse potentially asthmogenic activities to avoid the onset of seizures and exacerbations. There is a strong correlation between poor quality of life and poor asthma control (Boussoffara *et al.*, 2017).

Asthma is considered to be controlled when there are few symptoms, a possibility of normal physical activity, few exacerbations and emergency hospitalizations, no absenteeism (school or work), few side effects treatment-related as well as normal respiratory function (GINA, 2003; Magnan, 2009). The main goal of treatment, regardless of the level of asthma, is its control. This control can be affected by various factors such as smoking, environment, overweight,

misperception of symptoms, etc. According to the Haute Autorité de Santé (HAS) in France, 79% of asthma patients do not have asthma considered to be controlled. Indeed, it would be sub-optimal in Europe and in the world (Rabe *et al.*, 2004). The aim of the treatments is thus to maintain a controlled asthma over the long term, so as to improve the prevention of the progression of the disease as well as the quality of life.

The importance of good patient adherence to treatment is therefore paramount. However, most people would be unaware of the level of control of their asthma and would underestimate its severity (Patridge *et al.*, 2006). Asking specific questions, focused on the subject's daily life, would make it possible to confront the patient with the handicap represented by his asthma and would thus expose the need for treatment. It is not a question of "trapping" the patient, but of making him part of the co-construction of a care project, of making it a choice to improve his quality of life and not a medical obligation.

Suggestions within a study aiming to determine the factors of non-control of asthma (Choubi *et al.*, 2018). They relate to environmental factors in 52.3%, non-compliance with treatment in 42.2% of cases and poor inhalation technique is identified in 24.1% of patients. The factors of non-control of asthma, however, often remain intertwined and difficult to manage in a single consultation. Other studies insist on smoking as a factor that aggravates asthma and intervenes in particular in the non-control of the disease (Jridi *et al.*, 2016), or even psychological factors (Ritz *et al.*, 2014).

Measuring the level of asthma control is essential in monitoring the condition in order to be able to better manage and understand it. Questionnaires to be offered regularly to the patient such as the ACT (Asthma Control Test) make it possible to follow the evolution of the control of the disease, to promote the patient-practitioner relationship and to send messages about treatment compliance (Jabri *et al.*, 2017).

1-1-6- Risk factors and comorbidity

1-1-6-1- Risk factors

Asthma, the etiopathogenesis of which remains controversial, results from an interaction between genetic predispositions, environmental and physiological factors (Holgate, 1999; Postma, 1995). Indeed, genetic factors (the presence of asthma in the family is one of the most predisposing factors to asthma), environmental (life in the countryside would tend to preserve asthma compared to the urban environment (Demoly *et al.*, 2005) and physiological (overweight, physical exertion) increase the risk of developing asthma.

Certain psycho-social and behavioral factors are also important risk factors in the worsening or development of a respiratory pathology: poor compliance, age (the elderly and

young children are more vulnerable), presence of other pathologies (food allergies), history of hospitalizations for asthma (Lubret *et al.*, 2011), income and family situation, etc. Moreover, smoking habits constitute a major risk factor in asthmatic pathology (Axelsson, 2013).

Somatic disorders are also found among the risk factors for asthma. The study by (Gharsalli *et al.*, 2013) on 23 patients, highlights that 65% of difficult asthma have an allergic origin. Aggravating somatic risk factors were also highlighted in this study: gastroesophageal reflux observed in 10 patients, bronchial obstruction due to smoking in 4 patients, rhinosinusitis in 2 patients, Widal's syndrome found in 2 patients, hormonal factors present in 2 patients and one case of obesity. Personality as a vulnerability factor is also a field explored in health psychology (Bruchon-Schweitzer *et al.*, 2014). Indeed, the exact role of personality in the onset and progression of diseases has been studied under different models.

The presence of anxiety and depressive disorders seems to be a risk factor in asthmatic pathology, particularly in terms of disease control. Also, the anxiety score is higher in patients with mild asthma (Tiotiu *et al.*, 2015). In addition, (Bousoffara *et al.*, 2018) suggest in their study that poor asthma control is correlated with the significant presence of anxiety-depressive disorders. Indeed, such a disorder is significantly more important in the group with uncontrolled asthma, compared to the group with controlled asthma. This same observation by observing asthma control and a lower quality of life score in the group of anxious and depressed patients (Li *et al.*, 2015). In Cameroon, this link between anxiety-depressive disorder and asthma control is also found in a study by (Pefura-Yone *et al.*, 2016) where the prevalence of mental depression and anxiety is higher in asthma patients with uncontrolled asthma, compared to those with controlled asthma. Systematic research for these psychiatric comorbidities could make it possible to optimize the management of asthma patients (Pefura-Yone *et al.*, 2016).

The World Health Organization (WHO 2016) reports that if "we have not yet fully elucidated the root causes of asthma, strong emotions in the event of fear or anger for example (...) are among the other possible trigger factors". There is evidence which shows that panic disorders, attacks of nerves or even death linked to the asthma of a loved one predict a higher frequency of psychological asthma trigger (Vazquez *et al.*, 2017). On the other hand, psychoanalytic theories offer explanations for this phenomenon of triggering asthma linked to intense emotions.

While talking of "breathless" patients in reference to asthma patients and highlighting a link between asthma and three existential stages of life: born, live and die (Pheulpin, 2017). The clinic with asthma patients testifies to this association, such as the case of Marie, who explains "by shaking her neck with both hands that her twin died choked by the cord" (Pheulpin,

2017). The trauma that appears to be present in this patient takes the form of complicated grief that does not appear to be resolved but is expressed through the physical manifestations of asthma.

1-1-6-2- Co-morbidity

There are several associations or comorbidities between asthma and other chronic somatic and psychiatric pathologies. A study with 250 interviewed patients among them, 74%, i.e. 186 patients presented with one or more comorbidities including cardiovascular pathology at 57%, obesity at 20%, gastroduodenal reflux at 14% (Gharsalli *et al.*, 2014). Likewise, another study showed that out of 383 patients, 62% presented at least one comorbidity: 48% had gastroesophageal reflux, 25% arterial hypertension, 21% diabetes, 20% obesity and 4% psychiatric pathology (Badri *et al.*, 2016). These somatic comorbidities will play a role in the patient's quality of life (Badri *et al.*, 2016), as well as in disease control. Indeed, asthma that does not present with comorbidity is controlled in 41% of cases while asthma with at least one comorbidity is controlled in 20% of cases (Gharsalli, *et al.*, 2014). This same trend can be observed in Table II which shows the results of the work of (El Fadili *et al.*, 2016) on “asthma and comorbidities”.

TABLE II:
Impact of the presence of comorbidity (s) on asthma control Based on the work of (El Fadili *et al.*, 2016)

	Asthma with comorbidity (ies)	Asthma without comorbidity
Controlled asthma	49%	60%
Partially controlled asthma	18%	20%
Uncontrolled asthma	25%	15%

It is also noted that the more the number of comorbidities, the less chance of asthma to be well controlled. Asthma is controlled in 15% of cases when it is associated with comorbidity, in 5% of cases when it is associated with two or more comorbidities (Gharsalli, *et al.*, 2014). Regarding asthma and obesity, the review of the literature agrees that a certain number of objective epidemiological, clinical and physiopathological data points in the direction of a real link between the two conditions (Didier *et al.*, 2009; Elmghari *et al.*, 2016). Another fairly shared observation is that of growing the incidence and prevalence of asthma and obesity around the world (Cheikh Mhamed *et al.*, 2018). This comorbidity is not without impact on the control and severity of the disease. There is recognition that obesity contributes to the manifestation and severity of asthma (Boussoffara *et al.*, 2014).

To prevent this too frequent association, epistemological studies propose prevention based on several nutritional factors: vitamins A, D and E, zinc, regular consumption of fruits and vegetables as well as the Mediterranean diet could play a protective role (Didier *et al.*, 2011). There are links that reveal the asthma obesity association with smoking (Bergeron, 2009). Indeed, he notes that for smokers or obese people, an accelerated decline in FEV1 (maximum expiratory volume at one second) is observed. FEV1 is also systematically monitored in patients with asthma to assess the extent of respiratory involvement.

The comorbidity of asthma and gastroesophageal reflux disease seems generally observed but is less unanimous, due to a lack of a sufficient number of studies. However (Martinot *et al.*, 2005) report the study by (Sheikh *et al.*, 1999) in which of 84 asthmatic children questioned, 64% had abnormal esophageal pHmetry and 44% showed no digestive symptoms. In addition, there is a marked improvement in respiratory symptoms when treating gastric acid production. There is confirmation that asthma and gastroesophageal reflux disease are two common pathologies and the probability of being affected simultaneously by both pathologies is high (Miguéres *et al.*, 2012). The frequency of gastroesophageal reflux disease in asthmatics is higher than in the general population. This association is a two-way street since gastroesophageal reflux disease worsens airway hyper responsiveness and asthma worsens gastroesophageal reflux disease (Miguéres *et al.*, 2012). The asthmatic patient also suffering from gastroesophageal reflux disease is treated in accordance with the recommendations of the French Society of Gastroenterology on the diagnosis and treatment of gastroesophageal reflux disease.

Psychic and psychiatric comorbidities are also observed, in particular between asthma and anxiety-depressive disorder. Indeed, anxiety and depression are currently the most studied psychological aspects of the disease (Sultan and Varescon, 2012). Several studies highlight a significant correlation between having a chronic illness and a high level of anxiety and depression (Laurin *et al.*, 2012). This is particularly the case for asthma where symptoms of anxiety and depression are common in asthma patients (Bousoffora *et al.*, 2018; Khouchilia *et al.* 2018).

There is evidence explaining the fact that asthma as a psychosomatic illness elicits emotional reactions. Also, depression (as well as anxiety) are factors that negatively influence asthma control (El Ismaili *et al.*, 2018). It appears from the study that they carried out on 80 asthma patients, that depression is common in asthma patients with around 30% of patients affected (El Ismaili *et al.*, 2018).

In addition, there is evidence suggesting that the prevalence of anxiety and depressive disorders is higher in asthma patients than in the general population (Nascimento *et al.*, 2002) and (Van Lieshout *et al.*, 2009). While looking at the prevalence of anxiety and depression in

asthma patients, it was found that in 100 patients questioned, a depressive episode in 23% of cases, an anxiety disorder in 53% of cases and depression in 2% of cases. Cases, with a significant deterioration in the quality of life (Khouchilia *et al.*, 2018). Also, a related study revealed that depression is common in asthmatics (El Ismaili *et al.*, 2018). Same observation in the study of 300 patients' depression was found in 71% of cases (Raoufi *et al.*, 2015).

There is an explanation that asthma / anxiety-depressive disorder link by the unpredictability of asthma, which can result in crisis at any time, thus representing a possible and continuous threat and potentially life-threatening experience (Barnig *et al.*, 2016). As with somatic comorbidities, depressive and anxious psychic comorbidities are considered to be aggravating factors in asthma, in terms of its control, quality of life and exacerbations, as we have mentioned above. If anxiety and depression are frequent in asthmatics, this induces the need for a systematic search for these comorbidities for better management (Khouchilia *et al.*, 2018). Reports confirm that anxiety is associated with greater perceived dyspnea in asthma patients, even more so than may be depression (Li *et al.*, 2015).

Beyond depression and anxiety, studying the psychological characteristics of patients with asthma presents arguments that this respiratory disease can change these psychological characteristics as well as personality (Bulcun *et al.*, 2018). Asthma patients have higher scores for depression, hysteria, psychasthenia and social introversion, compared to the control group. The authors conclude by expressing that asthma patients have relatively more inactivity, guilt, pessimism, nonspecific complaints, irrational and introverted fears. They observe, however, that long-term asthma patients have less psychological distress, suggesting that they have learned to cope with the disease over time.

Alexithymia, which corresponds to a deficit in the expression of emotions, is also found in the list of co-morbidities with asthma. To recall that this deficit was originally observed in psychosomatic disorders such as asthma and Crohn's disease (Loas, 2010). He also highlights the fact that alexithymia is found between 30 and 60% in patients suffering from somatic pathologies including asthma. The still open question is whether alexithymia is primary or secondary in asthma. Namely, is it alexithymia that triggers asthma or asthma that causes alexithymia? In one way or the other, risk factor or consequence, alexithymia is found to be closely related to asthma and as such is included in the list of co-morbidities.

There is also a comorbidity between asthma and emotional disorders and this association would not be without impact. In asthmatic patients, psychological factors linked to intense emotions such as fear, anger do not represent a risk factor, but can influence its frequency and severity (Battu, 2014).

1-1-7- Beliefs and behaviors in care

Health beliefs or attitudes influence the motivation of the asthmatic subject to adhere to his treatment and therefore care (Tarquinio *et al.*, 2007; Bouvy *et al.*, 2008). Indeed, if the patient does not perceive the chronic nature of his disease, he will perceive the crises and exacerbations as unpredictable. This makes it difficult for the subject to think about the usefulness of his treatment.

Caring is defined as "the result of different levels of cognitive and behavioral development of an individual who is working on complex and uncertain decoding of what is happening to him" (Lamouroux, 2012). The asthmatic subject must be able to think of himself as suffering from a chronic disease and interpret his symptoms in order to initiate adequate care procedures. Indeed, for a patient to enter care, he must be able to recognize his symptoms as such (Herzlich *et al.*, 1984). This appropriation does not go without saying. It takes time to move from the perception of a dysfunction to the recognition of a symptom, to identify it as an alert and know the response to it. It therefore seems wise to focus on the emotional sphere of this somatic pathology: a good assessment of one's emotional states would probably facilitate this recognition.

Moreover, this difficult identification of warning signals underlines the complexity of anti-asthmatic treatment: it must be continued even when the symptoms disappear. How then can we think of a restrictive treatment as useful when the chronic aspect of the disease is not recognized and organic homeostasis is found? To understand the importance of treatment even during asymptomatic phases, it is first of all necessary to question the place of the disease in the representation of the patient.

This is a dimension to be explored, because stopping treatment or average compliance will lead to a return of symptoms, with a possible worsening of the pathology. Charles *et al.* (2011) analyze the relationship between representations related to asthma and compliance with inhaled corticosteroids. The results show that patients who are aware of the chronic nature of their pathology and of its consequences on daily life if the treatment is not taken have better adherence to medication. Conversely, the fear of side effects, the perception of insufficiently effective treatment as well as erroneous representations about corticosteroid therapy lead to poorer compliance. Therefore, being able to update some of these representations with other health partners, such as the psychologist, is relevant.

In addition to individual beliefs, family beliefs, particularly for young patients, children and adolescents evoked by (Chéron *et al.*, 2002). Indeed, the family circle may experience a certain skepticism about the effectiveness of the treatment and thus stop encouraging the adolescent to observe medical prescriptions. This can be explained by a lack of knowledge about

the disease and the treatment, expected effects, use, side effects or even environmental risk factors that may trigger an asthma attack (Mansour *et al.*, 2000; Ernst, 2001). A lack of information and knowledge about the disease leads to mistaken beliefs about the disease and its treatment and fosters reluctance to adhere to written recommendations. There were 40% of patients admitted to the emergency room for an asthma attack expressed that they did not know how to manage an altered respiratory state reported by (Radeos *et al.*, 2001).

In the same vein, (Magar, 2009) evokes health beliefs by using the HBM model: Health Belief Model (Rosenstock, 1974; Beckere and Maiman, 1975; Ogden, 1996). Model according to which the patient goes through several stages to understand, or even to believe that he is indeed suffering from a disease: being persuaded to be sick, being aware of the harmful consequences of the disease on health, being convinced that the proposed treatment will have a beneficial effect and that the advantages of the treatment will outweigh its disadvantages. Once the patient has been able to follow this path in different stages (nonlinear), he will be able to realize the benefits of the treatment and thus better respect it. This model thus shows that the probability of adopting a healthy behavior depends on the perceived risk and severity of a disease and on the relative estimate of the benefits of adopting a healthy behavior compared to its costs (Décamps, 2011).

In a field other than asthma, (Zani, 2002) gives an example which illustrates this model well: an overweight middle-aged smoker, who also has high blood pressure, may know that he is at risk of cardiac accident. vascular (perception of vulnerability) which could lead to death (perceived severity). Whether that person decides to quit smoking, dieting, or exercising will depend on their assessment of the benefits to their health over the costs that this will impose on them.

Another model presents beliefs about a sense of personal self-efficacy, which is a central notion in Bandura's socio-cognitive theory of learning (Bandura, 1994). It is an individual's personal belief in their ability to mobilize the resources necessary to bring a situation under control (Bandura, 1997). Its effects are salutogenic: self-efficacy moderates the impact of stressful events on health, it is associated with healthy lifestyles and good therapeutic adherence in sick people (Bruchon-Schweitzer, 2002a). Beliefs about self-efficacy depend on past experiences, but can also be influenced by observing the behaviors of people in your environment or by verbal persuasion (Weinman *et al.*, 2002).

Self-efficacy is an important concept in health programs aimed at developing self-management of sick people. However, if it is necessary for the patient to know the skills to have to manage the disease well on their own, it seems essential that they believe in their ability to implement these practices. Self-efficacy is a significant component in the self-management of

asthma. We will find this again in therapeutic education programs for example - which we subsequently develop - where group learning of the actions to be adopted in the event of a respiratory crisis makes it possible to develop the feeling of self-efficacy of the individual on his illness.

Furthermore, it is essential for caregivers to remember that any asthma attack is a moment of vulnerability. It impacts bodily, it overflows and amazes physically, but also psychologically. The crisis remains an experience of vital threat, a moment when the body betrays. It is a source of anxiety and an altered quality of life. The challenge for caregivers, once the crisis is under control, would be to be able to offer a space for speaking out, where the experience of the crisis can be developed. This proposal could be an opportunity to work on the disease, to raise awareness of the challenges of treatment. Taking into account the way in which the patient is experiencing the crisis, and the meaning it takes for him, appears to us to be a daring gamble, of course, but essential for a personalized care project. In this, a psychotherapy, centered on the emotions and on the singularity of the asthmatic patient, could be an interesting axis of the assumption of responsibility. The contribution of psychology would here make it possible to understand the development of a health behavior and thus to develop an adapted care approach, or even to reconstruct certain representations. Not "believing" in one's illness, believing that the disease is present in times of crisis as well as in times of respite, is likely to impact the patient's relationship with his treatment. As mentioned previously, the Health Belief Model by (Magar, 2009) shows that if the patient does not believe that he is suffering from a chronic condition, he does not perceive the benefit of the treatment either. Beliefs about the disease and about behavior in care can then have a significant negative impact on therapeutic compliance.

1-1-8- Main Research question

The main research question that shall guide this study will be “what is the impact of environmental risk factors on the prevalence and severity of asthma episodes among children, adolescents and adults in Yaounde”?

1-1-8-1 Specific questions

There will be 3 specific questions for this study

We shall have two quantitative research questions which will be “to what extent does biological, psycho-social and socio-economic factors associated to weight compared to the height of children 6/7, adolescents 13/14 years contribute to a more comprehensive understanding of asthma prevalence and severity in Yaounde”? We shall have one qualitative research question which will be “How does the physiological conditions related to breathing of adolescents 13/14 years looks like during rest, physical exercise, and waking up at night in relation to asthma prevalence and severity in Yaounde”?

1-1-8-2 Quantitative and qualitative specific questions

Quantitative research question 1: To what extent does the height and weight of children 6/7 and adolescents 13/14 years associated with their asthma in Yaounde?

Quantitative research question 2: To what extent are psycho-social, biological and socio-economic risk factors associated with asthma among children, adolescents and adults in Yaounde?

Qualitative research question 3: What is it like for a mother to live with an adolescent who is suffering of breathlessness and dying of asthma in Yaounde?

1-1-9- Objectives of study

An objective is communicating an intention which describes what we are proposing to achieve and accomplish at the end of the study. In other words, the objective of a study is what we propose to achieve, by precisising the method used to demonstrate a phenomenon. This study reveals two models of objectives: general and specific objectives.

1-1-9-1 General objective

This research work has as objective to determine the environmental risk factors associated to the prevalence and severity of asthma among children, adolescents and adults in Yaounde. This research comes under the context of global surveillance of breathing complications related environmental risk factors leading to the rise in burden of asthma in Yaounde. There is no comparative data on the prevalence of asthma among children, adolescents and adults in Cameroon. Our general objective will be; to determine environmental risk factors associated to asthma episodes in Yaounde. There were three principal risk factors ranging from psycho-social, biological and socio-economic identified that were associated to asthma episodes in Yaounde.

1-1-9-2 Specific objectives

From our general objective, we have derived three specific objectives which are aligning with our specific questions and our research hypothesis;

SO1: To identify the symptoms associated to asthma episodes in Yaounde. The symptoms of breathing complications among children, adolescents and adults.

SO2: To explore the relationship that exist between environmental risk factors and the rise in prevalence and severity of asthma episodes among children, adolescents and adults in Yaounde.

SO3: To evaluate asthma management among children, adolescents and adults in Yaounde. The management of asthma varied among children, adolescents and adults.

1-2 Aim and Interest of Study

1-2-1 Aim of study

This research aims to contribute in breathing, and environmental health studies. The focus being to provide data on the self-reported prevalence and severity of asthma among children, adolescents and adults through passive consent. Collecting data from parents of children 6/7 years completing questionnaire on their health and children at home, and the measurement of weight and height of children and adolescents in school with video on breathing difficulties watched by adolescents 13/14 years old after completing questionnaire on their breathing and health.

1-2-2 Study interest

Interest according to the Cambridge Dictionary is the feeling of wanting to give your attention to something or of wanting to be involved with and to discover more about something. In effect, the general interest of this study resides in the better understanding of breathing, and environmental health challenges with focus on asthma among children 6/7 years of age, adolescents 13/14 years of age and adults in Yaounde. This seeks to identify environmental risk factors that are responsible for breathing problems such as asthma among children, adolescents and adults as well as understanding the prevalence and severity of asthma in relation to hospital visits, admissions and management.

1-2-3- At personal level

Before birth many children will be exposed to breathing problems. This will continue as they grow up into adulthood, being mostly due to the external environment they are exposed to before and after birth. In effect, it has not been easy to get in contact with asthmatic patients due to the fact that we need a great sample size to be sure prevalence and severity of asthma can be identified at individual level. This research has enabled us to get into the unknown world of asthmatic patients especially children. While facing the host and environmental risk factors, and environmental health of children, adolescents and adults suffering from breathing problems with a better understanding of asthma in Yaounde.

1-2-4- At the scientific level

This study on breathing and the environment has particular interest given that it explains to us the origin and management of asthma observed in children, adolescents and adults in Yaounde. This study enables us to better understand the prevalence of asthma among children as well as parents. Also, there exist a clear relationship between exposure to environmental pollutants and the development of new onset of asthma and the exacerbation of asthma in those who are predisposed to suffer from existing breathing problems. Increase in hospital visits,

admissions and absenting from school will be a major handicap to school children with asthma, as well as psychological impacts.

1-3 Hypothesis of the Study

According to Sarandakos (1993:1991): “A hypothesis can be defined as a tentative explanation of the research problem, a possible outcome of the research, or an educated guess about the research outcome”. In effect, every scientific research originates from a hypothesis. For (Eric Rogers, 1966), hypotheses are single tentative guesses, good hunches- assumed for use in devising theory or planning experiments intended to be given a direct experimental test when possible. On the other hand, for (Creswell, 1994): “Hypothesis is a formal statement that presents the expected relationship between an independent and dependent variable.” Thus, a hypothesis is a tentative affirmation concerning a supposed relation between two or numerous variables, and in which after experimentation could be confirmed or infirmed. We have emitted a general hypothesis and numerous operational hypotheses. Given that this is a mixed cross-sectional study with no cause-and-effect relationship, we have identified 23 hypotheses now grouped into 3 hypotheses with a general hypothesis.

1-3-1- General hypothesis

As hypothesis we think that: Environmental risk factors are responsible for asthma episodes among children, adolescents and adults in Yaounde.

Our general hypothesis reveals that this study is correlational research. Here the independent and dependent variables do not apply because we are not trying to establish a cause-and-effect relationship. However, in this study there are two continuous quantitative variables of height and weight of children 6/7 and 13/14 years of age dominate any discrete variable number of students. There is a binary variable on breathing observations of adolescents 13/14 years related to asthma cases. We have in our study two independent variables (IV) which are asthma and age, and three dependent variables (DV) which are biological, psycho-social and socio-economic risk factors. In this case the IV dominates the DV given that increase in weight/height can be associated to asthma, meanwhile asthma cannot directly influence the weight/height in children, adolescents and adults. On the other hand, breathing difficulties will not always lead to asthma, meanwhile asthma will always lead to breathing problems.

Moving from the statement that a research hypothesis is a tentative guess which is pronounced to guide an investigation and that its formulation reveals measurable and manipulative elements in experimentation, we think that research hypotheses will enable conduct this research given that they are more precise than the general hypothesis and are proposed

responses to particular aspects of the general hypothesis in an easily measurable form, initiated to guide the investigation. This constitutes the operationalization of the general hypothesis.

Our independent variables: Prevalence of asthma, and age group

It has three modalities:

Modality 1: Relation of asthma, prevalence, severity and children 6/7 years of age

Modality 2: Relation of asthma, prevalence, severity and adolescents 13/14 years of age

Modality 3: Relation of asthma, prevalence, severity and adults

Indicators: Group of factors that when children adolescents and adults are exposed to will be leading to asthma from birth or from their environment.

Modality 1: Relation of asthma, prevalence, severity and children 6/7 years of age

Indicators: Genetic, body mass index, pollutants, allergens

Indices: Predisposed condition, weight/height, biomass solid fuels, outdoor pollutants, animals

Modality 2: Relation of asthma, prevalence, severity and adolescents 13/14 years of age

Indicators: Genetic, body mass index, pollutants, allergens

Indices: Predisposed condition, weight/height, biomass solid fuels, outdoor pollutants, animals

Modality 3: Relation of asthma, prevalence, severity and adults

Indicators: Genetic, pollutants, body mass index, allergens, psycho-social

Indices: Predisposed condition, weight/height, biomass solid fuels, outdoor pollutants, tobacco use

Our dependent variables (DV) of study are: The body weight/height ratio of children and adolescents and the breathing of adolescents as well as environmental risk factors (See TABLE III).

TABLE III :
Factorial plan of our study hypotheses

DV: Weight/Height ratio and breath difficulties		DV Increase in weight/height index in children and breathing challenges in adolescents(Y)
IV: Asthma, age group(6/7/13/14/adults)		
X ₁ = Asthma prevalence and severity in children 6/7 years		Y ₁ =Weight/Height body index Breathing(wheezing) challenges in the night/during physical activity.
X ₂ = Asthma prevalence and severity in adolescents 13/14 years		Y ₂ =Weight/Height body index Breathing(wheezing) challenges in the night/during physical activity.
X ₃ = Asthma prevalence and severity in adults		Y ₃ =Allergens Breathing(wheezing) challenges in the night/during physical activity.

Research hypotheses are more concrete than the general hypothesis. They are proposition of responses to particular aspects of the general hypothesis in an easily measurable form, put forward to guide an investigation, in effect they constitute the operationalization of the general hypothesis. With this effect, three research hypotheses that we will summarize in this synoptic table below were formulated in the context of this study. Here below traces the synthesis of our three main hypotheses and our research variables (See TABLE IV).

TABLE IV:
Summary of hypotheses, variables, modalities and indicators

General Hypothesis	Independent variables	Modalities and research hypotheses	Indicators and Indices	Dependent variables
Environmental risk factors are responsible for asthma episodes	Asthma and age group	RH1. There are correlations between	Tobacco use Indices Stress, emotions, depression	Tobacco and other social

among children, adolescents and adults in Yaounde.		psycho-social risk factors and asthma episodes	Wheezing, coughing, breathlessness Indices Sleeping at Night, physical activity	
Environmental risk factors are responsible for asthma episodes among children, adolescents and adults in Yaounde.	Asthma and age group	RH2. There is a correlation between biological risk factors and asthma episodes	Pollutants, allergens Indices Predisposed condition, dogs Cats,	-Wheeze -Breathlessness Weight/Height Diet
Environmental risk factors are responsible for asthma episodes among children, adolescents and adults in Yaounde.	Asthma and age group	RH3. There is a correlation between socio-economic risk factors and asthma episodes	Pollutants, allergens Indices Condition, dogs Cats,	-Wheeze -Breathlessness

It is important to precise that the modalities of our independent variable are same as the independent variables of our research hypothesis respectively.

1-3-2 Specific Research Hypotheses

Thus, we have formulated three operational hypotheses which response to our secondary questions, these gives account of the congruency between objectives and hypotheses. These are;

Specific Research Hypotheses 1: There is an association between psycho-social risk factors and asthma episodes. It is expected that tobacco use, emotions, depression and stress will worse quality of life in asthmatic patients.

Specific Research Hypotheses 2: There is an association between biological risk factors and asthma episodes. It is expected that genetics and body mass index will worsen the quality of life of patients.

Specific Research Hypotheses 3: There is an association between socio-economic risk factors and asthma episodes. It is expected that the environment exposed to either urban or rural, exposed to pollutants, number of siblings will worsen the quality of life of patients.

1-4 Delimitation of topic

Under this title, we got interested in the limits of our work. In effect, by limit of study, we refer to the numerous barriers, the degree and depth of our investigations towards the realization of our study. This refers to us to divide the work into the thematic, spatial-temporal and material plan.

1-5 Significance of Study

This study used international questionnaires to collect information on breathing and the environment with focus on self-reported asthma prevalence and severity; addressed how people are getting diagnosed with asthma, unplanned visits including emergency room visits and hospital admissions, and evaluation of different policies for management of asthma in children, adolescents and adults. Key components of the written questionnaires are: surveillance, asthma management, confirmation of doctor diagnosed asthma, socioeconomic status, early life environment, potential risk factors in the environment, home environment, and smoking. The data will provide new information on the prevalence and severity of asthma among children in Yaounde, which allowed some comparisons of new data among adolescents and adults with existing data from previous research.

1-6 Geographical scope

The importance of this topic on Global surveillance of breathing complications (asthma prevalence and severity in Yaounde, Cameroon): Relation to environmental risk factors as other issues of concern, had to see us work in all the divisions of the Centre Region, but due to the structure of the research to focus more around the cities with high population density and immediate neighborhood, access to families. Also limited funding have constituted a serious barrier to conduct this research. For this reason, we have delimited our work in randomly selected primary and secondary schools within the seven sub divisions of the Mfoundi Division.

1-7 Thematic delimitation

The global surveillance of breathing complications (asthma prevalence and severity in Yaounde, Cameroon): Relation to environmental risk factors is a surveillance of breathing issues and symptoms like asthma in relation to environmental risk factors such as the use of paracetamol, antibiotics, truck traffic, breast feeding, farm animals, cats and dogs, air pollution, tobacco use, body mass index, diet, cooking fuels, birth weight, migration and siblings.

The global surveillance of breathing and the environment in Yaounde was focused in the capital city of Yaounde, Cameroon. A community and school-based survey was conducted among Children aged 6/7 years, adolescents 13/14 years and their parents/guardians, with total N = 2648, children aged 6/7 years N= 722, adolescents 13/14 years N=1066, and their parents/guardians N=860, selected through multilevel stratified random sampling across all seven

subdivisions of Mfoundi Division of Yaounde (Capital city, an Internationally validated questionnaire was used to investigate the presence of breathing and allergic diseases. This was community-based research related to breathing and environmental problems. Measurement of the weight and height of children aged 6/7 years and adolescents 13/14 years old, and video on breathing experiences in adolescents.

1-8 Temporal delimitation

This study which extended through a duration of four years (September 2016 to June 2020) marks the end of this study in the Master cycle within the department of specialized education with option Assistance, Orientation and Extra Scholar Education and specialty Assistance and Community Action. Our field work and data management extended over a duration of twenty-nine months from the period between January 2018 to May 2020, period in which work is divided into three steps:

The first step was theoretical and focus on the constitution of empirical and theoretical documentation that supported the problem; the second phase on its part was that on the field. This was marked by the collection of data in the milieu in which are found target and accessible subjects of our study; the third and last phase on its part comprised of data entry, data checks, analysis interpretation of data collected on the field. This phase ended on the date of deposit for expert's review of our research.

1-9 Clarification of key concepts

In perspective of defining the concepts that are contained in this work and at the end to better understand the ramifications around this topic, we will try to clarify different notions that it is comprised of.

1-9-1- Global surveillance

This is a global method of collecting data which is comparable to other countries and can be representative of the reality in other countries or a region.

1-9-2- Global health

Kick bush defines global health as: 'those health issues that transcend national boundaries and governments and call for actions on the global forces that determine the health of people. This definition also has a broad focus but has no clear goal, is passive in its call for action, and omits the need for collaboration and research. Elsewhere, the European Foundation Centre calls for a European approach which makes global health a policy priority across all sectors based on a global public goods foundation.

1-9-3- From surveillance to research

Health surveillance involves systematic data collection and observation and is an essential component of an outbreak response. It serves to guide the management of cases and helps prevent and respond to outbreaks in the future. Public health surveillance activities benefit the overall health of the community; individuals, therefore, have a reciprocal obligation to contribute to surveillance and thereby promote the common good. Those involved in collecting data for health surveillance activities must pay attention to the ethical principles and values underling the activities. This helps to generate trust and avoid public distress.

1-9-4- Surveillance

Will be to detect, prevent and respond. Thus, information sharing is mandatory in surveillance, promotes transparency and generates trust. With access possibility of allowing people to opt out.

1-9-5- Research

Involves data collection and observation, data analysis, prevention and response. Consent is always mandatory in research, while participation is never mandatory in research.

1-9-6- Research during an epidemic

There is a moral obligation to conduct research, this should be ethically sound. With carefully designed scientifically robust protocols, this should not compromise the safety of health personnel, and with established mechanisms for rapid ethics review.

1-9-7- Surveillance during an outbreak

Participation is not always mandatory. Universality should be assessed on a case-by-case basis. Rapid data sharing is necessary and ethical. The public has a reciprocal obligation to contribute to surveillance. The protection of personal data is crucial, while informed consent is not required by default.

1-9-8 Breathing

According to the Oxford living Dictionaries, *the* process of taking air into and expelling it from the lungs. ‘his breathing was shallow’.

Breathing is one of the only “vital functions” of the body that can be controlled both involuntarily and voluntarily (Ley, 1999).

1-9-9 Environment

According to the Oxford living Dictionaries, the surroundings or conditions in which a person, animal, or plant lives or operates. ‘Survival in an often-hostile environment’

1-9-10 Asthma

According to the World Health Organization, asthma attacks all age groups but often starts in childhood. It is a disease characterized by recurrent attacks of breathlessness and

wheezing, which vary in severity and frequency from person to person. In an individual, they may occur from hour to hour and day to day. This condition is due to inflammation of the air passages in the lungs and affects the sensitivity of the nerve endings in the airways so they become easily irritated. In an attack, the lining of the passages swell causing the airways to narrow and reducing the flow of air in and out of the lungs. Asthma is a serious, sometimes life-threatening chronic respiratory disease that affects the quality of life for more than 24 million Americans, including an estimated 6 million children. Although there is no cure for asthma yet, asthma can be controlled through medical treatment and management of environmental triggers according to the US Environmental Protection Agency.

1-9-10-1- Technical definition

“Asthma is a chronic inflammatory disorder of the airways in which many cells and cellular elements play a role. The chronic inflammation causes an associated increase in airway hyperresponsiveness that leads to recurrent episodes of wheezing, breathlessness, chest tightness, and coughing, particularly at night or in the early morning. These episodes are usually associated with widespread, but variable, airflow obstruction within the lung that is often reversible either spontaneously or with treatment.” This chronic inflammation causes pathological changes in the airways that can be irreversible, such as hypertrophy of the smooth muscle, new vessel formation, and deposition of collagens beneath the epithelium. Studies based on autopsies of patients who have died from asthma have demonstrated acute and chronic inflammation of the airways, including the smallest airways (<2 mm in diameter). These results underscore the importance of using inhaled corticosteroids.

1-9-10-2- Operational definition

While the technical definition focuses on the underlying mechanism of the disease, an operational definition is needed for health services. The following definition is proposed. Any patient who presents to the health services with chest symptoms (including cough, breathlessness and/or wheezing, often at night) that come and go, vary from day to day, and especially if they cause the patient to wake up and sometimes to get up at night, should be suspected of having asthma. Such patients should be carefully examined; if no other cause is found and the symptoms persist for some period of time, they should be considered to have asthma.

1-9-11 Prevalence

According to the English Cambridge Dictionary the fact of something existing or happening often : They noted the prevalence of this attitude among leading financial experts.

1-9-12 Severity

According to the Oxford living Dictionaries, the fact or condition of being severe. 'Sentences should reflect the severity of the crime', 'hay fever symptoms vary in severity', 'she stared at me with mock severity'

1-9-13 Psychosomatics

In a very general way, the term psychosomatic refers to the clinical and theoretical approach to the psychological causes of somatic illnesses. This is an extremely broad concept encompassing heterogeneous lines of research; indeed, the notion of cause or psychological factor remains vague today. Even if, for the majority of physicians, most patients and the general public, this dimension of medicine appears essential, it is based more on the clinical experience and intuition of practitioners.

1-9-14 Psycho-social

This is related to processes and factors that are both social and psychological in origin according to the British Dictionary.

1-9-15 Psychic

This is having to do with the mind and the emotions rather than with the body. Regular exercise has psychic as well as physical benefits according to the Cambridge Dictionary.

1-9-16 Conversion

It was in an article dating from 1894 on the "neuro-psychosis of defense" that Freud used the term conversion for the first time. It reads: "In hysteria, the act of rendering the irreconcilable representation harmless occurs because its amount of excitement is transposed into the bodily, which is why I would like to suggest the name conversion. This leap of the psyche into somatic innervation will remain an enigma.

1-9-17 Repression

Repression occupies a crucial place in Freud's theory of neuroses. Through this mechanism, we have seen with regard to conversion, the conscious representation of a traumatic memory or of the fantasy linked to this trauma, is the object of a burial in the unconscious layers of the psyche. Repression has often been identified with a defense of the ego, thus sparing the anguish of having to erase in its functioning memories painful or detrimental to its ideals.

1-9-16 Stress

The word stress comes from an importation of the French word distress into the English language. He found several meanings around the notion of constraint exerted by a force on a material and by extension, on a living organism. Biologists such as Cannon and Selye are among the first researchers to study animal and human responses to assault.

CHAPTER 2: LITRATURE REVIEW

There is no data related to breathing and the environment with focus on asthma prevalence and severity among children, adolescents and adults in Yaounde, Cameroon. Allergic respiratory conditions are a major public health challenge worldwide. According to the World Health Organization (WHO) estimates, about 300 million people around the world suffer from asthma and about 250,000 people die from the disease each year.

2-1 Asthma and Environmental Risk Factors

2-1-1 Definition, data and legal contexte

Although there are laws in Cameroon that prohibits all practices that deteriorate our environment and pose a breathing health problem, the population, faced with the omnipresence of foods, lack of affordable clean energy and technology, non-biodegradable solid waste generally prefers the option of going against laws available to survive. The Environmental Protection Act (EP Act) provides for the management, conservation, protection and improvement of the environment, the prevention, control of pollution, the assessment of the impact of economic development on the environment and the sustainable use of natural resources.

The environmental management law of 1996 is the main instrument that regulates environmental issues in Cameroon even though there are subsidiary instruments such as the Prime ministerial decree and Joint orders of the relevant concerned. Section 1 of the 1996 Law on waste management states that waste shall be treated as in an ecological rational manner to eliminate or curb their harmful effect on human health and natural resources, the fauna and flora and on the quality of the environment in general” Section 30. It equally provides that “any person who produces or own waste, shall eliminate or recycle it or have it eliminated or recycled. Most often this is not done. Furthermore, Section 43(2) states that, the condition under which waste is collected, sorted out, stored, transported, recuperated, recycled or processed in any other way shall be laid down by an enabling decree of this law. It is common knowledge in Cameroon that the enactment of implementation decrees is always belated. Some are either never enacted at all, or if finally, they are, the statute they are to enable may have been repealed because Cameroon suffers from instability of laws.

The Cameroon Parliament deliberated and adopted the penal code of Law N°2016/007 of 12 July 2016. The President of the Republic enacted the following laws related to breathing and the environment in Cameroon; Chapter IV: Public Health, Section 261: Pollution of air and water: Whoever by his operations: b) so pollutes the atmosphere as to render it harmful to human health,

shall be punished with imprisonment for from 15 (fifteen) days to 6 (six) months, or with fine of CFAF 5 000 (five thousand) to CFAF 1 000 000(one million), or with both such imprisonment and fine. Also, Section 229-1: Toxic waste: (1) whoever, unauthorized, does not, with immediate effect, discard of dangerous or toxic waste generated by its company shall be punished with imprisonment of five 5 (five) to 10 (ten) years and a fine of from CFAF 5 000 000 (five million) to CFAF 500 000 000 (five hundred million).

Cameroon also ratified the World Health Organization Framework Convention on Tobacco Control (WHO FCTC) in 2006. This is the first and only global health treaty. In its Part III: Measures relating to the reduction of demand for tobacco. Article 8: addresses the adoption and implementation of effective measures to provide protection from exposure to tobacco smoke in indoor workplaces, public transport, indoor public places and, as appropriate, other public places. Also, in Part V: Protection of the environment. Article 18 addresses concerns regarding the serious risks posed by tobacco growing to human health and to the environment.

The environmental management law of 1996. Article 9 states that “it is formally prohibited to burn plastic packages in open air, to throw them into nature, or to proceed to their burial”. This is equally not respected as burning plastic or throwing them into nature is a common practice in Yaounde, Cameroon. It is rare to see a person who has been caught or punished for committing such an act. However, in order to ensure the effective implementation of this instrument, the Minister of Environment, Nature Protection and Sustainable Development has issued circulars, setting up committees and operational teams with competence to monitor and sanction all violators of the law. The first of such is Circular No.096/c/CAB/ MINEPDND of 10 April 2014, relating to the control of the conformity and the repression of violators of Joint Order No.004 / MINEPDEP/MINCOMMERCE of 24 October 2012 on the prohibition of plastic packages inferior to 61 microns in Cameroon.

2-1-2- Etiology of asthma and environmental risk factors

The substantial increases in the incidence of asthma over the past few decades and the geographic variation in both base prevalence rates and the magnitude of the increases support the thesis that environmental changes play a large role in the current asthma epidemic. Furthermore, environmental triggers may affect asthma differently at different times of a person’s life, and the relevant risk factors may change over time.

Short-term studies of risk factors may suggest a lower likelihood of asthma, whereas the same factors may be associated with greater risk if follow-up is more prolonged. This pattern may relate to overlap between different wheezing phenotypes in early childhood, only some of which persist as asthma in later childhood and adulthood. Because of this phenomenon, we

examine here the risk factors for persistent asthma at different ages, specifically the prenatal period, infancy, childhood and, briefly, adulthood. Asthma comprises a range of heterogeneous phenotypes that differ in presentation, etiology and pathophysiology. The risk factors for each recognized phenotype of asthma include genetic, environmental and host factors. Although a family history of asthma is common, it is neither sufficient nor necessary for the development of asthma (Burke *et al.*, 2003).

2-1-2-1- Psychological factors

A number of animal models have suggested that prenatal maternal stress acts through regulation of the offspring's hypothalamic–pituitary–adrenal axis to decrease cortisol levels, which may affect the development of an allergic phenotype. Although there is a correlation between caregiver stress early in the infant's life and higher levels of immunoglobulin E in the infant (Wright *et al.*, 2004).

Taking the first cigarette is usually not taken on a whim, more often it follows preparation, a scenario sometimes built up together. Unlike initiation into alcohol or cannabis, cigarettes are perceived less in terms of an object that will provide pleasure, than as a route of initiation into becoming an adult. Positive (integrating into a group, pleasing others) or negative (anxiety, sadness, etc.) emotions cause people to continue to smoke. In addition to the psychoanalytic vision for which the object cigarette refers to a phallic symbol, we readily evoke a smoker who "sucks" a cigarette, the use of cigarettes is a tool of containment, to break the ice, to open the dialogue, to seduce. (Dautzenberg *et al.*, 2017).

Subsequently, several so-called "positive" motivations lead to the maintenance of addiction: the search for pleasure (Honda, 2005; Lesourne, 2007), the need for stimulation and excitement (Valleur and Bucher, 2006), psychic self-medication, relaxation and restraint, psychological well-being (Kerr *et al.*, 2006, Lesourne, 2007), stress reduction (Kerr *et al.*, 2006) and speaking of physiological regulation of emotions (Fernandez *et al.*, 2010).

2-1-2-2- Social factors

2-1-2-2-1- Family structure

Family size and the number and order of siblings may affect the risk of development of asthma. The hygiene hypothesis posits that exposure of an infant to a substantial number of infections and many types of bacteria stimulates the developing immune system toward nonasthmatic phenotypes (Schaub *et al.*, 2006). This may be exemplified in the real world by large family size, whereby later-born children in large families would be expected to be at lower risk of asthma than first-born children, because of exposure to their older siblings' infections.

Although this theory has been supported by some studies of allergy prevalence (Matricardi *et al.*, 1998), it has been partially refuted by recent studies of asthma prevalence suggesting that although large family size (more than 4 children) is associated with a decreased risk of asthma, birth order is not involved (Goldberg *et al.*, 2007). Furthermore, doubt has been cast on simplistic renditions of this hypothesis, in that infections per se cannot explain some epidemiologic patterns (e.g., prevalence rates for allergy and asthma are high in some South American countries according to the International Study of Asthma and Allergies in Childhood, where exposures to infection are higher than in some countries with lower rates of asthma). In addition, not only allergic but also autoimmune and other chronic inflammatory diseases are increasing (Bach, 2002), a trend that is difficult to explain by the hygiene hypothesis alone, since allergic and autoimmune diseases are associated with competing immunologic phenotypes.

Smoking tobacco (Gilliland *et al.*, 2006) or marijuana (Tetrault *et al.*, 2007), (Taylor *et al.*, 2002) may give rise to symptoms suggesting asthma, although symptoms of cough and sputum production, suggesting chronic bronchitis, are more common. As in childhood, the differential diagnosis should include other forms of airway inflammation and other causes of intermittent dyspnea and wheezing, such as cardiac failure. However, new-onset asthma can occur at any age, without prior illness or concomitant disease. Atopy as a risk factor for asthma is less common with increasing age (Jaakkola *et al.*, 2006) but occasionally it is the dominant trigger. Air pollution may affect adult asthma, but more often it is a factor worsening pre-existing asthma rather than a cause of incident asthma (McCreanor *et al.*, 2007); (Chen *et al.*, 2006), (Johntson *et al.*, 2006).

2-1-2-3- Biological factors

2-1-2-3-1 Genetic factors

Family and twin studies have indicated that genetics plays an important role in the development of asthma and allergy (Willemssen *et al.*, 2008) likely through several genes of moderate effect (i.e., genes associated with relative risks in the range of 1.2–2). (Holberg *et al.*, 1996). Genome-wide linkage studies and case–control studies have identified 18 genomic regions and more than 100 genes associated with allergy and asthma in 11 different populations (Lawrence *et al.*, 1994).

Although some 50% of preschool children have wheezing, only 10%–15% have a diagnosis of “true” asthma by the time they reach school age (Sears *et al.*, 2003). Commonly described phenotypes in early infancy and childhood are transient wheezing, nonatopic wheezing, late-onset wheezing and persistent wheezing (Lowe and Simpson, 2005). Only transient wheezing in early infancy has been well characterized, with decreased airflow rates on pulmonary

function testing at birth (Martinet and Wright, 1995), onset of wheezing within the first year and resolution by mid-childhood with no lasting effects on pulmonary function.

Among the biological factors, we can find the nicotinic receptors which are part of the causes of nicotine dependence. The number and sensitivity of these receptors play a role in the onset and maintenance of tobacco dependence. These receptors are genetically determined, but prolonged exposure to cigarette smoke in the form of a “shoot” makes them more sensitive (Dautzenberg *et al.*, 2017).

2-1-2-3-2- Lung function

Decreased airway calibre in infancy has been reported as a risk factor for transient wheezing (Martinet and Wright, 1995), perhaps related to prenatal and postnatal exposure to environmental tobacco smoke (Dezateux *et al.*, 2002). Furthermore, the presence of airways with decreased calibre has been associated with increased bronchial responsiveness and increased symptoms of wheeze (Dezateux *et al.*, 2002). Several studies have suggested an association between reduced airway function in the first few weeks of life and asthma in later life (Young *et al.*, 2000). The magnitude of the effect of this risk factor in isolation (i.e., without concomitant allergy) is unclear; perhaps individuals with smaller airways require less stimulus (i.e., airway inflammation) before symptoms become apparent.

Children with wheezing (and diagnosed asthma) persisting to adulthood have a fixed decrement in lung function as early as age 7 or 9 years (Sears *et al.*, 2003). Recent studies of preschool children have documented abnormal lung function in children with persistent wheezing as young as age 3 years (Lowe and Simpson, 2005). However, some infants in whom persistent wheezing develops have normal lung function shortly after birth, which suggests a critical period of exposures within the first few years of life, before the development of these persistent abnormalities in expiratory flows (Martinet and Wright, 1995). In contrast, infants who exhibit early transient wheezing have decreased airflow shortly after birth (Turner *et al.*, 2004). Maternal smoking with in utero nicotine exposure has been correlated with this type of lung dysfunction, (Lødrup Carlsen, 2002).

2-1-2-3-3- Sex and gender

Sex affects the development of asthma in a time-dependent manner. Until age 13–14 years, the incidence and prevalence of asthma are greater among boys than among girls (De Marco and Locatelli, 2000). Studies through puberty (Bronnimann and Burrows, 1986) have shown a greater incidence of asthma among adolescent and young adult females (Dodge and Burrows, 1980) and a greater proportion of males with remission of asthma (Becklake and Kauffmann, 1999). Before age 12, boys have more severe asthma than girls (Meurer *et al.*, 2000),

with higher rates of admission to hospital (Kao *et al.*, 1990). In contrast, adult females have more severe asthma than males, with more hospital admissions (Chen *et al.*, 2003), slower improvement (Galanter *et al.*, 2008), longer hospital and higher rates of readmission (Chen *et al.*, 2003).

Most authors have attributed these changes in prevalence and severity to events of puberty (Nicolai *et al.*, 2001), although mechanisms for differences between the sexes have not been established. In childhood, airway hyperresponsiveness is more common and more severe among males (Le Souëf *et al.*, 1995); however, airway hyperresponsiveness increases in females during adolescence (Ernst *et al.*, 2002) such that by adulthood it is both more common and more severe among adult women (Sears *et al.*, 1996). Similar findings have been reported from studies of atopy, which is more common in males before age 13 (Sears *et al.*, 1993); during adolescence, the rate of new-onset atopy is higher among females (Barbee *et al.*, 1987), so that by young adulthood the prevalence of atopy is almost equal.

2-1-2-3-4- Adult-onset asthma

Asthma in adults may have persisted from childhood, may have occurred as a relapse of earlier childhood asthma (whether or not recalled by the individual) or may be true adult-onset asthma with no symptoms in earlier life (Bauer *et al.*, 1997). New-onset asthma in adulthood may have environmental (especially occupational) causes with or without allergen sensitization (Eagan *et al.*, 2002). Although adult asthma may develop in relation to specific drug treatments (e.g., β -blockers, nonsteroidal anti-inflammatory drugs) or, in women, the use of hormone replacement therapy (Troisi *et al.*, 1995), occupational exposure to sensitizing agents or irritants is more common.

2-1-2-3- Prenatal and postnatal environmental factors

Although genetic predisposition is clearly evident, gene-by-environment interaction probably explains much of the international variation in prevalence rates for allergy and asthma. Environmental factors such as infections and exposure to endotoxins may be protective or may act as risk factors, depending in part on the timing of exposure in infancy and childhood. Some prenatal risk factors, including maternal smoking, have been firmly established, but diet and nutrition, stress, use of antibiotics and mode of delivery may also affect the early development of allergy and asthma. Later in childhood, putative risk factors include exposure to allergens, breastfeeding (which may initially protect and then increase the risk of sensitization), family size and structure, and sex and gender. In adulthood, recurrence of childhood asthma may be just as common as new-onset asthma, which may have an occupational basis. A better understanding of

these risk factors may eventually lead to opportunities for primary prevention of asthma (Padmaja *et al.*, 2009).

2-1-2-3-1 Prenatal tobacco smoke

Risk factors in the prenatal period are multifactorial. Assessment is complicated by the variety of wheezing conditions that may occur in infancy and childhood, only some of which evolve to classical asthma (Padmaja *et al.*, 2009). Prenatal maternal smoking has been consistently associated with early childhood wheezing (Stein *et al.*, 1999); and there is a dose–response relation between exposure and decreased airway calibre in early life (Dezateux *et al.*, 1999). Prenatal maternal smoking is also associated with increased risks of food allergy (Lau, *et al.*, 2002). Cytokine responses in the cord blood (Devereux *et al.*, 2002) and concentrations of nitric oxide in exhaled air in newborns. Studies have shown a clear prenatal effect of smoking; this effect is increased when combined with postnatal smoke exposure (Frey *et al.*, 2004).

2-1-2-3-2- Diet and nutrition

Observational studies examining prenatal nutrient levels or dietary interventions and the subsequent development of atopic disease have focused on foods with anti-inflammatory properties (e.g., omega-3 fatty acids) and antioxidants such as vitamin E and zinc. Several studies have demonstrated that higher intake of fish or fish oil during pregnancy is associated with lower risk of atopic disease (specifically eczema and atopic wheeze) up to age 6 years (Willers *et al.*, 2007). Similarly, higher prenatal vitamin E and zinc levels have been associated with lower risk of development of wheeze up to age 5 years (Litonjua *et al.*, 2006). However, no protective effect against the development of atopic disease in infants has been shown for maternal diets that excluded certain foods (e.g., cow’s milk, eggs) during pregnancy (Kramer and Kakuma, 2006). The authors of 2 recent studies reported an inverse relation of maternal vitamin D levels with wheeze in early life, but no relation with atopy or symptoms in later life (Camargo *et al.*, 2007).

2-1-2-3-3- Antibiotic use

The association between prenatal antibiotic treatment and subsequent development of atopic disease has been examined in 2 ways: with treatment as a dichotomous predictor (i.e., any antibiotic use) and by number of courses of antibiotics during pregnancy. Longitudinal cohort studies examining any antibiotic use showed a greater risk of persistent wheeze and asthma in early childhood (Jedrychowski *et al.*, 2006), and a dose–response relation between number of antibiotic courses and risk of wheeze or asthma (McKeever *et al.*, 2002).

2-1-2-3-4- Mode of delivery

The development of atopy was 2 to 3 times more likely among infants delivered by emergency cesarean section (Macaubas *et al.*, 2003), although no such association occurred with elective cesarean section. Potential reasons for these findings include maternal stress and differences in the infant's gut microflora associated with different modes of delivery (Nafstad *et al.*, 2000).

2-1-2-3-5- Breastfeeding

The influence of breastfeeding on the risk of childhood atopy and asthma remains controversial. The following represents observational data accumulated to date. Some studies have shown protection (Bergmann *et al.*, 2002), whereas others have reported higher rates of allergy and asthma among breastfed children (Sears *et al.*, 2002). A meta-analysis (Gdalevich *et al.*, 2001) and several individual studies (Oddy WH, 2000) showed that exclusive breastfeeding for at least 3 months was associated with lower rates of asthma between 2 and 5 years of age, with the greatest effect occurring among those with a parental history of atopy. One of the difficulties in interpreting these data lies in differentiating viral-associated wheeze in childhood from development of atopic asthma. In a longitudinal birth cohort study, breastfeeding was associated with a higher risk of atopic asthma in later childhood, with the greatest influence occurring among those with a maternal history of atopy (Sears *et al.*, 2002).

2-1-2-3-6- Antibiotics and infections

The use of antibiotics has been associated with early wheezing and asthma in several studies (Kozyrskyi *et al.*, 2007). Greater antibiotic use might also represent a surrogate marker for a higher number of infections (perhaps viral) in early life. Viral infections of the lower respiratory tract affect early childhood wheezing. Whether lower respiratory tract infection promotes sensitization to aeroallergens causing persistent asthma is controversial: childhood viral infections might be pathogenic in some children but protective in others (Lemanske *et al.*, 2006).

2-1-2-5-6- Allergic sensitization

Total serum immunoglobulin E level, a surrogate for allergen sensitivity, has been associated with the incidence of asthma (Sears *et al.*, 1991). High levels of immunoglobulin E at birth were associated with greater incidence of both atopy and aeroallergen sensitivity but not necessarily asthma. However, sensitization to aeroallergens, particularly house dust mite, cat and cockroach allergens, is well documented as being associated with asthma (Tariq *et al.*, 1999).

For example, impairment in interferon γ production at 3 months was associated with a greater risk of wheeze (Celedón *et al.*, 2002). Immaturity in neonatal immune responses may promote the persistence of the Th2 immune phenotype and development of atopy (Prescott *et al.*, 2003), but an association with persistent asthma is as yet unproven. More recent work has focused

on the role of the innate immune system in handling and presentation of antigens and suggests that polymorphisms in Toll-like receptors (Tulic *et al.*, 2004), may play a greater role than previously recognized in the development of the skewed immune responses associated with persistent asthma (Lauener *et al.*, 2002).

2-1-2-5-7- Exposure to environmental tobacco smoke

Postnatal exposure to environmental tobacco smoke, especially from maternal smoking, has been consistently associated with respiratory symptoms of wheezing (Stein *et al.*, 1999). Exposure to environmental tobacco smoke also consistently worsens asthma symptoms and is a risk factor for severe asthma (Lin and Rehman, 1995).

2-1-5-8- Exposure to animals

Although several studies have demonstrated a lower risk of development of atopy and asthma with exposure to farm animals in early life, the findings of studies of the influence of exposure to domestic cats and dogs have been inconsistent (Simpson and Custovic, 2005). In some studies, exposure to cats was associated with a greater risk of allergic sensitization (Almqvist *et al.*, 2003), whereas other studies showed a lower risk (Huss *et al.*, 2001). Exposure to dogs may be protective not only against the development of specific sensitization to dog allergen (Almqvist *et al.*, 2003) but also against other sensitization (e.g., to house dust mites) and asthma. Other studies of exposure to dogs have suggested that protection against wheezing may be mediated by high levels of endotoxin (Campo *et al.*, 2006).

2-1-2-5-9-Gene-by-environment interactions

The effects of gene-by-environment interactions in asthma are complex. In some cases the genes code for enzymes that detoxify inhaled agents (e.g., glutathione transferase genes and environmental pollution), whereas in other cases, the exposures may have a more direct effect on gene expression via epigenetic mechanisms, such as DNA methylation or histone modification. Epigenetic modification of DNA is believed to be responsible for the phenotypic differences that develop over time between monozygotic twins (Fraga *et al.*, 2005). It has been suggested that it is principally through epigenetic modification of DNA that lifestyle and chemical exposures affect susceptibility to diseases (Oiu J, 2006). Nutrition and diet (e.g., folic acid, vitamin B₁₂), smoking, exposure to microbial products, maternal stress and maternal care are potential factors influencing fetal genetic expression, and a further window for epigenetic modification in early life may allow environmental factors to modify a child's genome with the potential to cause or prolong allergy and asthma. Further work is needed to verify and understand these risks.

2-1-2-6- Socio-economic factors

Children of parents with lower socio-economic status have greater morbidity from asthma (Halfon and Newacheck, 1993), but findings with respect to the prevalence of asthma are mixed (Litonjua *et al.*, 1999). Such results may depend both on how socio-economic status is measured and on the specific outcome examined. Some studies have reported associations of lower socio-economic status with greater airway obstruction and symptoms but not with a diagnosis of asthma (Erzen *et al.*, 1997). Whether socio-economic status is as relevant to the incidence of allergy and asthma as it is to the expression, severity and management of these diseases remains unclear. Parental stress has also been prospectively associated with wheezing in infancy (Wright *et al.*, 2002), and family difficulties have been linked to asthma (Klennert *et al.*, 2001). Children whose caregivers report high levels of stress and who have difficulties parenting are at greatest risk for asthma (Klennert *et al.*, 1994).

2-1-2-6-1- Occupational asthma

Asthma related to workplace exposures has been documented in many occupational settings. Commonly associated occupations and exposures include car painting (isocyanates), hairdressing (various chemicals), domestic and commercial cleaning (cleaning solutions), health care professions (latex) and baking (flour dust), among many others (Bakerly *et al.*, 2008). The relation between exposure to substances in the work-place and new-onset adult asthma was explored among 6837 participants with no previously reported asthma symptoms in phase I of the European Community Respiratory Health Study (Kogevinas *et al.*, 2007). Exposure to substances known to cause occupational asthma was associated with a higher risk of asthma overall.

2-2 History of psychosomatics

The history of psychosomatics does not boil down to that of a medical discipline in the modern sense, but spills over into most of the human sciences. The very idea of psychosomatic illness refers to different conceptions of the human being, it raises the very general question of the relationships between the “soul”, the “spirit”, the “mind” on the one hand and the human being body, the somatic, the organic... on the other hand. But psychosomatics poses other questions than the break between soul and body; it is of interest not only to doctors, but also to philosophers, anthropologists, psychoanalysts and also specialists in the natural sciences (Patris, 2010).

2-3 Asthma psychosomatics

It is the most common psychosomatic pathology in pulmonology. Strong emotions trigger or exacerbate asthma attacks. The hypothesis of suffering secondary to a conflict of dependency and separation with the mother was put forward (Alexander, 1950). Hyperventilation

syndrome (formerly called spasmophilia): It is a functional somatic syndrome and sometimes occurs when other functional symptoms occur, such as in non-coronary chest pain. It also occurs during a panic attack. There is polypnea, sometimes with the existence of real attacks of tetany. The chronic form is more difficult to diagnose because polypnea is not evident. He then sets in hypocapnia and we can find general symptoms such as chest pain, palpitations or tachycardia, dizziness, syncope, paresthesia, dyspnea, cramps, tremors, tetany, dysphagia, belching or even asthenia for example. The patient may be asked to perform a test for induced hyperventilation which is likely to reproduce symptoms. But this test has no real reliability objectively. The treatment is carried out in particular through behavioral techniques of respiratory rehabilitation

2-4 Psychosomatic inflation

The appropriation by the everyday language of a word resulting from scientific research should appear as a sign likely to alert the inventor, concerning the maintenance of the relevance of this word. Reconsidering its heuristic value may then prove necessary. Not having cared enough about it, (Selye, 1956) will undoubtedly have contributed in part to the galloping inflation with which the notion of "stress" that he developed in the 1960s is today affected, as well as to its impoverishment. Like the economy of which it uses the circuits, the inflation of which a word is a victim diminishes its significance; Continuing with this financial metaphor, let's say that meaning is to the word what money is to the economy: the more volume the circulation of the first increases, the more devaluation threatens the second.

2-4-1 Misunderstandings of causality

Does the success encountered by the use of the word "psychosomatic" double up with the therapeutic successes justifying this keen interest? In other words, does recourse to the "psychosomatic" designation of suffering make its treatment more accessible? If the patient is himself described as "psychosomatic", is his recovery thereby facilitated? When the qualifier "psychosomatic" applies, no longer to the patient or to the disease but to the medical process itself, can the latter demonstrate an effectiveness equal or superior to a medicine which is not psychosomatic? These questions necessarily arise, by the very fact of their inclusion in the field of health, and consequently of medicine. They obey what one might call the logic of medical care, "as taught at the University, or as may be presented. (e) -in an illusory way- by the media: symptoms; medical examination (s): diagnostic; - treatment; - healing "(Pascal, 1995).

2-5 The patient-doctor relationship and the transfer

Any patient-doctor relationship involves formal respect (patient complaint, examination, diagnostic research, prescription, etc.) which results from learning more or less ritualistic and repetitive behaviors requiring the doctor's ability to adapt to varying situations but sufficiently

“typed” to identify a certain number of problems and clinical traps (such and such a patient is known to be a “great hysteric”, such a hypochondriac claims and threatens, such a psychopath does as he pleases...). But the relationship also takes place on the level of the meeting of two subjectivities, of two people who are not fully aware of the why of their attitudes and their reactions to the attitude of the other (Patris, 2010).

2-6- Asthma management

2-6-1- Medical care

The diagnosis of asthma is made via an interrogation, a clinical examination, a functional exploration allowing the demonstration of a bronchial obstruction and its reversibility and other explorations aimed essentially at eliminating differential diagnoses (Taillé, 2004). The medical management of asthma is aimed at reducing symptoms, the severity and frequency of attacks, and reducing airway obstruction. The basis for the therapeutic management of adult and pediatric asthma patients consists of repeated administration of rapid-acting bronchodilators, early prescription of systemic corticosteroid therapy and oxygen therapy (Lubret *et al.*, 2011). However, the management is adapted according to the severity score of the disease, whether it is severe acute asthma or not, whether the patient is in the exacerbation phase or not. Two classes of drug are used: long-term treatments, primarily anti-inflammatory, and symptomatic bronchodilator treatments for exacerbations. Inhaled corticosteroids are currently the most effective and fastest way to reduce bronchial inflammation (Taillé, 2004).

2-6-2- Psychological care

The occurrence of a chronic disease disrupts the bases on which an individual builds his identity. The announcement of the disease prompts the patient to rethink their identity. (Bury, 1982) speaks of a “biographical break”. In the case of asthma, beyond the diagnosis, exacerbations echo this initial rupture. Asthma has a particular specificity, because the disease is not visible, only the presence of symptoms is visible (Lamouroux, 2012). In addition to medical care, psychological care can be offered and advised for better control and quality of life for the asthmatic patient. Several approaches can be proposed.

2-6-2-1- Cognitive and Behavioral Therapies - CBT

Cognitive and behavioral approaches are often a benchmark in terms of dealing with negative emotions, possible inadequate behaviors caused by chronic diseases as well as compliance with long-term treatment. This type of therapy is based on an empathetic, demonstrative, motivating, contractual and evaluable therapeutic relationship in order to allow the patient to be a "motivated partner and responsible for his disease".

The goal of using CBTs in chronic disease is to collect enough information to develop hypotheses about the factors that cause and maintain the condition. For this, the conceptualization of the case makes it possible to understand the functioning of the patient's problem via a double analysis: a diachronic analysis linking the patient's history and personal, family and social data and a synchronic analysis to know how the problem arises. Maintains in the here and now. Several techniques are used in CBT for behavioral and cognitive management of asthma (Newinger *et al.*, 2005).

2-6-2-2- Mindfulness

In the wake of so-called third wave or new generation TBIs, we find care focused on mindfulness: Mindfulness. This treatment proposal aims at emotional regulation by learning how to detect emotion in order to welcome it in an attitude of openness and acceptance. The basis of mindfulness is this particular attention, of each moment, which brings the subject to live fully, without being automatically drawn into his thoughts, desires or memories. Another pillar of mindfulness is the notion of acceptance, trying not to let yourself be overwhelmed by your emotions, thoughts, desires (Baer, 2003).

2-7- Psychosocial management of asthma in the emergency room

Admission to the emergency room for a patient may be a mishap or some sort of habitual practice, as exacerbations and asthma attacks are recurrent. Psychosocial care is centered on the analysis and understanding of patients admitted to emergency rooms, so it seems essential to distinguish the issue of their arrival (Accident vs Habit) (Lamouroux, 2012) to do this, three steps make it possible to understand the issues for the patient in the conduct of care:

2-8- Models in health psychology and applications to the study of asthma

2-8-1- Transactional processes: stress, coping and social support

In health psychology, there are several models aimed at explaining how individuals live and above all adapt to different stressful experiences encountered on their life course or their health journey. The models differ according to “the theoretical context which inspires them, the nature of the antecedents and the criteria to be predicted and the pathways linking their various components” (Bruchon-Schweitzer and Boujut, 2014).

Three types of process offer explanations of how psychosocial history affects health: sociocognitive, psychobiological, and transactional models. The interest here is focused on the transactional process only and more specifically on the TIM (Transactional, Integrative, Multifactorial) model of (BruchonSchweitzer and Boujut, 2014). This model is derived from previous models: the biopsychosocial model of (Engel,1977), the psychosomatic current, the epidemiological approach, the transactional model of stress of (Lazarus and Folkman, 1984),

presents a dynamic conception of health by restoring the subject's subjectivity by considering him as a real actor of his health.

The Transactional, Integrative and Multifactorial model developed by (Bruchon-Schweitzer and Boujut, 2014) is; Transactional: It is inspired by processes developed to deal with aversive situations (stress, support, coping, etc.); Integrative: It includes components of a different nature (psychological, social, economic, biological, etc.); Multifactorial: It includes factors with different functions (predictors, transactions, criteria).

Stress is at the origin of the transactional model, defined this concept as being a "particular transaction between the person and the environment, in which the situation is evaluated by the individual as taxing or exceeding the resources that could threaten his/her well-being" The transactions between the individual and his/her environment correspond to the cognitive, emotional and behavioral efforts that the person develops to adjust to the situation. It takes place in two evaluation phases which develop in parallel with each other (Lazarus and Folkman, 1984).

Primary assessment phase where the individual determines whether the situation is dangerous or not for him or her. Perceived stress (by the announcement of a chronic illness, for example) corresponds to the meaning that the individual will attribute to the event and that he will be able to assess in terms of loss, threat or challenge. Secondary assessment phase where the individual measures his personal and social resources to cope with the stressful event. Several studies, particularly in health psychology, suggest a link between stress and the onset or progression of diseases (Ogden, 2014), (Cropley *et al.*, 2005) argue, for example, that the more stressful the pace of life, the higher the number of reported physical symptoms.

A Chinese study also makes the link between parental stress and the prevalence of asthma in children by highlighting the prevalence significantly associated with socio-economic and psychosocial stress on parents (Deng *et al.*, 2018). In the case of asthma, stress can be seen as a cause and consequence. Indeed, a stressful situation could be the trigger for an asthma attack, asthma would come as a reaction to stress. But the somatic manifestations of asthma, the fear of not being able to breathe could also be a stressful element leading to the onset of an asthma attack. One not excluding the other, stress and asthma can run in a vicious cycle. Internal (coping) and external (social support) elements can then intervene in this vicious circle.

There is need to highlight the negative influence of high stress on asthma symptoms and on asthma-related quality of life (Georga *et al.*, 2018). The authors present the benefits of stress management, that is, stress management in the treatment of asthma by comparing two groups, one benefiting from stress management techniques, the other not. Patients who completed the

stress management program experienced a significant decrease in perceived stress, improved quality of life with asthma, and better asthma control.

The adjustment strategies of coping, that is to say to cope with, to adjust, to adapt. This concept of adjustment or adaptation derives from stress theories, as presented by (Lazarus and Folkman, 1984). These authors refer to coping as "the set of constantly changing cognitive and behavioral efforts to manage specific external and / or internal demands that are perceived to threaten or overwhelm a person's resources." Thus, coping refers to the process by which an individual seeks to cope with aggressions, constraints or conflicts, internal or external, by developing resources that allow him to endure or overcome the situation, in order to find a certain biopsychosocial balance. Adaptation work is a dynamic and multifactorial process and its goal is to best preserve the physical and psychological integrity of the individual (Bendrihen and Rouby, 2007).

The asthma attack can appear to the patient as an aggression endangering his respiratory system, or more generally his life. The patient must then face these crises, these different symptoms by implementing reassuring and effective strategies. The absence of strategies put in place by the patient is therefore likely to intervene in the control of the disease. The study by (Martins *et al.*, 2012) report that avoidance strategies or passive coping strategies are associated with poor asthma control, as well as high anxiety.

Air pollution remains a major challenge in Cameroon. We know almost nothing about the pollutants emerging from urban centers and their impact on weather systems, crops, and public health at large. There's little monitoring of pollution with insufficient emissions inventories. Researchers say that they struggle to find funding to study the issue. Not only is pollution in these cities killing local residents, it has been found these emissions may even be altering the climate along the coast of central Africa, leading to changes in the quality of life for people.

Cameroon has experienced significant increase in ambient fine particle exposure over the past decades from waste burning, firewood burning, and more that could be associated to increasing asthma mortality and morbidity. According to the 2020 State of the Global Air Report, Cameroon is ranked 8th among the top 10 countries with the highest population weighted annual average PM_{2.5} exposures in 2019, with PM_{2.5} Concentrations of 64.5µg/m³.

CHAPTER 3: PSYCHOSOMATIC THEORIES ON ASTHMA

Traditionally, psychosomatics is defined as "any somatic disorder which includes in its determinism a psychological factor intervening, not in a contingent way, as can occur in any affection, but by an essential contribution to the genesis of the disease" (Mukendi Mpinga, 2018). The author specifies that in the strict sense, any disorder accompanied by objective clinical or biological anatomical alterations can enter the field of psychosomatics, such as bronchial asthma for example. Also assimilated to somatic pathology are the psychosomatic expression of emotions such as anxiety or somatic manifestations of mood disorders such as depression. Finally, some authors include in the field of psychosomatics the somatic consequences of certain behavioral disorders: alcoholism, smoking, etc. Psychosomatics is part of a comprehensive, holistic approach to the sick individual and thus rather than considering organ medicine only, it emphasizes medicine for the organism as a whole (Bécache, 2012).

The foundations of psychosomatic medicine as a discipline are based on clinical observations written by psychoanalysts such as Georg Groddeck, Sandor Ferenczi or even Félix Deutsch (the latter having even attempted to develop a dynamic nosography and a psychosomatic typology). But it is Groddeck (1866-1934). Inventor of the concept, which is today considered the father of psychosomatics. Groddeck's Ca differs from Freud's. Indeed, whereas for Freud the Ca is a chaos without a general will which opposes the Superego and the Self. For Groddeck, it is a vital, universal, unifying and forceful principle with a coded message. It is expressed through dreams and behavior. Georg Groddeck is a precursor in that he is the first to affirm and demonstrate that any organic disease independently of any physical factor has an internal psychic factor and therefore that any treatment must take this factor into consideration, reinsert it into the psychophysical unit. The body and the mind get sick at the same time. Illness is a behavior that must be interpreted (Freud S, 1999) (Freud S, 1963).

3-1- Alexander's American School Theory (1940s)

A pioneer of psychosomatic medicine and leader of the American psychoanalytic movement, Franz Alexander (1891-1964) was of Hungarian origin. He turned to psychoanalysis after having studied physics. Like many of his compatriots (Michael Balint, in particular), it was in Berlin that he trained (he was analyzed by Hans Sachs). Alexander began his work in the 1940s with his collaborators from the Chicago school. It results in the establishment of personality profiles in relation to so-called psychosomatic illnesses. Alexander believes in an evolving

identity between psychic and physiological processes and seeks to understand the organic articulation of the psychic and the somatic. For him, psychosomatic illnesses are a physiological response to excessive emotional stress.

Alexander tends to prove that anger, guilt, aggression are expressions that are often repressed and produce a tension conducive to disorganization of the visceral organs. He gives the example of the Koch bacillus responsible for tuberculosis. This infection is widely known to pulmonologists and infectious disease specialists. However, the development of tuberculosis in individuals infected with Koch's bacillus depends on their immunity. During stress, an individual carrying the bacillus remains in the latent state, however, may develop tuberculosis. Alexander concluded that tuberculosis can be considered a psychosomatic illness.

Based on his observations, (Alexander, 2002) emphasizes that each emotion felt by the subject has a physiological correlation: blushing shows embarrassment, crying is sadness, laughing is joy, etc. this correlation occurs through the vegetative nervous system (sympathetic and parasympathetic). Many organs are connected to the vegetative nervous system and are therefore conducive to responding somatically to an emotion, a shock, a trauma.

In addition to the vegetative nervous system, there is the hormonal system, which is also activated under stress and responsible for somatic changes. For example, inhibited aggressiveness can stimulate the adrenal medullary sympathetic system. The secretion of corticosteroids is then increased and causes an increase in blood pressure. (Alexander, 2002) attempts to establish correlations between a personality type and a predisposition to certain diseases. In his book psychosomatic medicine published in 1950, he will detail his hypotheses concerning the relations between a pathology and a type of personality or problem. Disorders of the respiratory system such as bronchial asthma (Stéphanie, S, 2009).

3-2- Freudian theory of nevroses (1894)

The notion of psychic trauma according to Freud, observing hysterical patients who have developed symptoms as a result of trauma, finds a dissociation between the representation of the trauma and the affect (the emotional charge) associated with this representation. In other words, what the subject represses is in the order of anxiety. The benefit of the conversion symptom would be to spare the subject the suffering of anguish. But let us note that the memory would be to spare the subject suffering of anguish. It was in an article dating from 1894 on the "neuropyschoses of defense" that Freud used the term conversion for the first time. It reads: In hysteria, the act of rendering the irreconcilable representation harmless occurs because its amount of excitement is transposed into the bodily, which is why I would like to suggest the name conversion. This leap of the psyche into somatic innervation will remain an enigma. Freud,

however, will put forward a hypothesis of a neurological order to explain the ways in which this leap of the psyche into the somatic takes place: the conversion occurs by following a motor or sensory innervation which is in an intimate correlation or more relaxed with the traumatic lived experience.

Repression occupies a crucial place in Freud's theory of neuroses. Through this mechanism, we have seen with regard to conversion, the conscious representation of a traumatic memory or of the fantasy linked to this trauma, is the object of a burial in the unconscious layers of the psyche. Repression has often been identified with a defense of the ego, thus sparing the anguish of having to erase in its functioning memories painful or detrimental to its ideals. The neurotic symptom (conversion, phobia, and obsession) testifies to a compromise between the repressed, always active in depth, and a reality, in other words the constraints of relational life.

This process captures post-traumatic neurotic symptoms fairly well when the trauma is recent and the chronological link to the onset of the symptom is evident. The Freudian hypothesis extends this logic to infantile traumas, the sexual significance of which it discovers. Psychoanalysis is based on a psychogenetic theory of neuroses. Freud refutes his extension to somatic illnesses because he does not want these illnesses to be within the reach of psychoanalytic treatment and that the lifting of repression does not serve to reverse the course of such illness.

3-3- The Psychosomatics French School of Pierre Marty Theory (1972).

In parallel with Alexander's work, a group of doctors was formed in France whose research focused on psychosomatic disorders in adults. The pioneer of this group is Pierre Marty (1918-1993), who notes that "in seriously ill patients, the noise of their somatic disorganization goes hand in hand with the silence of their psyche. As early as 1957, he formulated a theory according to which the subject would participate in the onset of his disease and therefore, in the establishment of his own healing process. It is therefore the quality of mentalization that protects against somatic illness.

Mentalization is the capacity for psychic development of an individual. It is strongly linked to Freud's first topic which distinguishes the conscious, the preconscious and the unconscious. The assessment of the quality of mentalization is equivalent to that of the quality of the preconscious. It is in the preconscious that the work of linking representations takes place because it is the reservoir of representations from different eras. More or less linked to each other and more or less ready to emerge from the conscious. A malfunction of the preconscious is thus a prelude to the appearance of psychosomatic disorders. Marty speaks of the preconscious as "the hub of psychosomatic economics" he will also be interested in the quality of the preconscious of his patients.

According to Marty, the qualities of the preconscious are assessed on: Its thickness or density: number of layers of representations accumulated or stratified throughout the history of the subject, its fluidity: quality of the representations and their circulation through the different eras. Its permanence: availability at any time of all representations in terms of quality and quantity. For Marty, psychosomatic patients have a "flattening" of the preconscious, which means they lack preconscious, mental representations. Due to this lack of mentalization and this lack of mental representation, psychosomatic patients have a common psychic functioning. Marty describes two characteristics resulting from this defect of the preconscious which are:

Essential depression: Essential depression was first described by Marty in 1963 as "a depression without object, neither self-accusation, nor even guilt, where the feeling of personal worthlessness and narcissistic injury is oriented electively towards the somatic sphere. ". this depression often goes unnoticed. There is no crying, no sadness, no worthlessness. It manifests itself by a decrease in vital tone. It reflects a decrease in the tone of life instincts. It evolves towards a progressive disorganization, an operational thought. There is an erasure of mental dynamics (i.e. condensations, identifications, projections, fantasy and dream life).

The death instinct is the master of the place. It is preceded by diffuse anxieties. The patient continues his daily activities but in a robotic way. Sleep can be normal, there is no appetite disturbance. Narcissism is almost non-existent. These are patients who survive, more than they live. These patients are often unaware of the existence of their depression, which announces the shutdown of psychic life and the service of somatizations in the form of seizure, reversible illnesses, or serious illnesses with organic lesions. This mode of operation can become chronic and the individual enters an operative life. It then progresses in its own process of somatization.

Operative thinking is a type of thinking specific to psychosomatic patients. It highlights the lack of fantastic and dreamlike activities of the subject. It is a current, factual way of thinking, unrelated to any fantastic activity or symbolization. It is linked to conscious reality, to action, in a limited temporal field. She does not use any neurotic or psychotic mental mechanisms. She seems devoid of libidinal value and aggressive. It is a non-thought because it has lost the link with its instinctual source. It's a thought expressed in a monotonous, robotic tone. It does not involve any elaboration. It is not used to communicate but to discharge an inner tension. It is a motive thought, of discharge.

Operative thought summarizes the mental failures of the subject to integrate drive tensions through fantasy and dream. The psychic life of the subject is limited, due to an overinvestment of the perceptual while the discourse turns out to be factual, without imaginative elaboration. The subject seems cut off from his inner life, he seems to have lost his access to the

imagination or to reverie. He dreams of little if not real facts of everyday life. Operative thought marks the operational life of these subjects. It is a fragile development, an unstable state that sets in during a gradual, slow disorganization. It reduces the individual to a certain social uniformity. In the pronounced forms of operative life, one finds in particular a degradation of the quality of the superego and its substitution by a powerful system, the ideal ego. Marty considers somatization as a disorganization which follows, after a period of latency, the disorganization of mental functions. By resuming the work of Freud on transference neuroses and current neuroses, Marty wanted to set up a more in-depth classification. He was therefore led to classify mental structures in his patients according to four groups: Psychoses, mental neuroses (equivalent to psychoneuroses or transference neuroses in Freud). Mental neuroses are considered to be very well mentalized with a sufficiently strong Oedipus,

Character neuroses are more or less well mentalized neuroses which form a large group including classical neuroses to the exclusion of behavioral neuroses (the levels of fixation of character neuroses are different from those of the latter). Most of the so-called normal individuals fall into this group. Joyce (Mac Dougall, 1819) calls these individuals "normopaths". For her, these people can periodically and randomly experience somatic disorganizations due to an insufficient permanence of mental elaboration capacities and an insufficiency of the thickness of the preconscious. The risk is then a stupefaction of the mental apparatus in the event that the affects received are too violent. These subjects have difficulty introjecting and maintaining good object relations (that is, the presence of the object must be in objective reality because they have difficulty separating).

Behavioral neurosis is a poorly mentalized neurosis. The patients have a desperate, unstable behavior. The investment in objects is immediate. They have no processing skills because their preconscious is "flattened". There is no intrapsychic conflict, all conflicts are between themselves and the external object. They don't have anxiety. The subject lives in the factual, current and finds it impossible to project himself into the future.

Marty devised a process to try to explain somatization. According to him, the evolution of an individual takes place gradually from a first mosaic (juxtaposition in the newborn of uncoordinated homeostatic organizations). It is the mother who will make it possible to link these functions which will then be organized and hierarchical to become a common and autonomous system. This organization is linked to the instincts of life. This evolution is punctuated by obstacles, areas of trauma and injuries. The organization will therefore be marked by different fixing zones depending on the individual, depending on the trials and injuries encountered. These fixation bearings are points of weakness, but play an essential role in the process of defense

against severe somatic disorganization. The quality of these levels of fixation depends on the quality of the experience of early childhood, the general vital quality of intrasystemic movements and the quality of life instincts which depend on the unconscious.

When an individual encounters a situation that overwhelms their current adaptive capacities, a counter-evolutionary movement of disorganization begins. The fixation stages allow the regression to be stopped with the onset of a reversible benign pathology which will allow psychological reorganization. On the contrary, if there is no possibility of fixation at sufficiently solid levels, the disorganization continues quietly without benign somatic pathology and risks causing serious progressive disease.

Marty therefore distinguishes two modalities of the somatization process: The process of somatization by regression which results in reversible pathologies benign with crisis (asthma attack, back pain, ulcer crisis, hypertensive crisis). These somatizations occur in subjects whose psychic functioning is organized in a neurotic-normal mode. Their mentalization is usually satisfactory and the process of somatization by instinctual de-linking which leads to autoimmune diseases). This process develops in subjects presenting a non-neurotic organization or in subjects having undergone psychological traumas which reactivated deep and early narcissistic wounds. The dimension of narcissistic loss is present. This generates a state of instinctual de-linking which modifies the psychosomatic balance of the subject.

3-4- Relational psychosomatic theory of Sami-Ali (2013).

Relational psychosomatics refers to a new epistemology, as well as to a method aimed at understanding and helping human beings in a particular situation, that of illness (Sami-Ali, 2013). This theory differs from the psychosomatic approach presented earlier by the fact that Sami-Ali, who is at the origin of it, conceives of the human being as "a unity transcending the distinction of soul and body". This unity of which the author speaks refers to two types of causality which are opposed and yet include each other: linear causality and circular causality. Linear causality underlies the psychic / somatic relationship, which in a circular motion moves closer or further away from each other.

On a practical level, the relation indicates the link between two variables which are the psychic functioning and the situation in which the person is engaged. Psychic functioning is defined in relation to dream activity declined in 4 forms: absent or present dreams, present then absent, absent then present, to which is added a fifth form, which is the instability of functioning. The situation corresponds to the pathology and refers to a soluble or insoluble conflict. If it is soluble it is the starting point for functional pathologies, if it is insoluble it refers to the relational impasse. Relationship impasse is a concept proposed and studied by Sami-Ali according to which

the person experiences a conflict without outcome and where each time one believes to find a solution, it is illusory (Sami-Ali, 2013). According to this approach, asthma appears to occur in a context of soluble conflict, that is, the solution occurs through symptomatic formation. Breathlessness then becomes a sign of a conflict that needs to be resolved. Relational psychosomatics then proposes to set up a relational dynamic in which conflicts can be updated and integrated.

3-5- Psychosomatic thinking in Germany (1920)

In Germany, the years following the First World War were rich in reflections on psychosomatic medicine. Thure Von Uexkull relates that: "During the war, colds were rare on the face as long as the troops were advancing and fighting. On the other hand, they multiplied during retreats or stoppages. "This also gives the example of the fighter's tremor. It is a condition that affected some soldiers during World War I. They started to tremble after a concussion. The tremor could be severe and lead to incapacity for work. Different hypotheses have been developed to determine the origin of this tremor. According to the neurologist (Oppenheim *et al*, 1999), "the concussions would cause a shaking of the most fragile areas of the brain and the tremor would be the consequence of the anatomical disorders caused by this shaking of the brain. On the other hand, the neurologist Nonne, opposed to his colleague's theory, proposes the hypothesis of a psychic origin of these tremors. He claims that the tremor had to be curable by psychotherapy and proves it by curing with psychotherapy and hypnosis several soldiers suffering from this symptom. Bergmann is also a big name in German psychosomatic medicine. He reported cases of pneumonia in elderly people who had attended a funeral. In the 1920s, a psychoanalytic clinic was created in Berlin where patients with internal illnesses were treated.

3-6- Cannon and Selye stress theory (1956)

The word stress comes from an importation of the French word distress into the English language. He found several meanings around the notion of constraint exerted by a force on a material and by extension, on a living organism. Biologists such as Cannon and (Selye, 1956) are among the first researchers to study animal and human responses to assault. Stressful situations were not initially understood as necessarily pathogenic; they are part of the life of any organism struggling to protect its existence and restore the balances (mainly neuro-endocrine) disturbed by the changes occurring in its environment.

Psychologists and psychiatrists (such as Jean Delay in France) have extended the notion of stress to psychological situations and traumas involving defense mechanisms, which can be defeated, thus allowing mental pathologies or disorders to set in psychosomatic illnesses. We knew that violent trauma (electric shocks, confinement, etc.) could cause organ damage in

animals, such as digestive ulcerations. The word stress now refers to the psychological effects of situations of tension, anguish, failure, mourning ... (anxiety, anguish, depression) which could also be the result of microtraumas which are not always clearly identified.

We will pass quickly on the psychophysiological current, for which (Selye, 1956) thought to have developed an explanatory theory of the bodily disorders, in connection with a psychic disturbance. For this author, as for all those who have continued his work, the ambition was to explain how a situation of constraint (translate: of a psychic nature), by itself, could cause an alteration in bodily homeostasis, or even trigger certain pathological states (therefore legitimately called "psychosomatic"). The reductive aspect of this model ultimately oriented the research of this "psychophysiological" current towards taking into account the "subjectivation" of stress, as the perceptual data that accompany it. From an objective phenomenon, the "stress" studied in this context has become (Engel G, 1961) "perceived stress", a partially subjective phenomenon "marked" as a result by the imprint of the subject (Bruchon , 1994).

3-7- Alexithymia and psychosomatic model (1972)

This first psychosomatic "model" ("modeling" never having been the ambition of the real pioneer that was Groddeck) proposes, as we can see, a "fair" interaction between the two orders of phenomena observed, psychic and bodily. , the first producing, however, a destabilizing effect on the second. It was a few years later, in 1972 to be exact, that (Sifneos,1996) another American researcher, proposed during a European conference on psychosomatics -in Vienna- to use the term "alexithymia" to account for the specific psychic functioning of " psychosomatic patient ". What interests us here is less the psychophysiological mechanism accompanying the alexithymic phenomenon described by Sifneos, than the explanation suggested to justify its relevance.

According to the author himself (quoted by Pedinielli), "observations (of some) patients with psychosomatic illnesses have shown that they exhibit impoverished phantasmal life and seem unable to use words to express their emotions. The term "alexithymia" was coined to describe these failures (underlined by us) ". Using this notion developed with Nemiah, Sifneos() takes the same direction as Alexander, insofar as the alexithymic disposition (translate: of psychic nature) is considered to contribute to the appearance of certain somatic disorders. Therapeutic engagement with such patients then requires relational mobilization primarily centered, not on the verbal, but on the "sensitivo motor".

3-8- Alexander's theories- Paris school- Marty theory

Contrary to Alexander's theories, the Paris school does not retain this notion of psychosomatic "specificity" at the level where the American school envisioned it. Attached to founding a discipline which would finally find its "own nosographic criteria", Marty indeed gives

up considering the somatic dimension of the disease as a significant datum: "A determined somatic disease, responding to classical medical nosography (bronchial asthma, for example). Can occur in different economic conditions from one individual to another, sometimes also different in the same subject depending on the time. Knowledge of the structure of a subject as well as the appreciation of current variations in this structure, are necessary at all times to establish a diagnosis, to estimate a prognosis, to decide on a treatment ". What Marty means here by "structure" naturally refers to the way in which character neuroses are structured, conducive to the disorganization that he himself described; it is indeed at the psychic level that the leader of the first "French institute of psychosomatics" considers the specific structural psychosomatic.

Evolutionism, after Freudian metapsychology, is the second referential model to which Marty anchors his theoretical inspiration, and the process by which he describes this psychic failure implies the existence of evolutionary movements and counter-evolutionary movements, capable of accounting for the mode psychosomatic organization. Certain risks of somatic pathology are for example evoked, as soon as a counter-evolutionary movement concerns a "too powerful regressive organization". The disorganization, after having struck a mental apparatus structured in this way, threatens to reach the somatic sphere - being admitted that, in the evolutionary process, the "mental" succeeds the "somatic". By attempting in this way to "develop for Psychosomatics a system similar to that which Metapsychology constitutes for Psychoanalysis", Marty aims to build a "metapsychosomatology" which is based essentially on two aspects of **Freudian theory**.

On the one hand it favors the economic approach of the psychic apparatus, and on the other hand it uses data from the first topic, such as the "preconscious" for example. In patients with conditions considered to be psychosomatic, for example, the "thickness of the preconscious" would be less. Another aspect of the "operative life" of the psychosomatic patients described (Marty,1988), "essential depression" quite well expresses this notion of implicit normativity, since it translates according to him "the lowering of the tone of the Life Instincts at the level of mental functions. (underlined by us) ". In other words, Marty describes a somatic life grappling with a "mental apparatus" whose "disorganizations" affect its "normal" course; the "normal" functioning would place above all the human being "in harmony" with his phantasmatic life and his unconscious. In other words, Marty describes a somatic life grappling with a "mental apparatus" whose "disorganizations" affect its "normal" course; the "normal" functioning would place above all the human being "in harmony" with his phantasmatic life and his unconscious.

These disorganizing accidents of "normal" somatic life are moreover to be partly attributed to a social environment, which represents real "obstacles" to this mental life as this

author conceives it; according to him, society in fact imposes very narrow limits on each one as regards the exercise of his individual freedom, and this "exiguity (...) almost provokes our astonishment at not witnessing the outbreak of somatic diseases more frequently. ". Undoubtedly, the constraints imposed on "normal mental activity" seem to appear to Marty here as potentially generating somatic disorders.

Whether it is entirely structural or partially caused by a constraining environment, should the "poverty" of mental life revealed by the Paris school in so-called "psychosomatic" patients be admitted as a cause of somatic symptoms? or should it not be considered primarily as a consequence, in certain "operative" patients? In the first case, it may prove useful to "enrich" this mental life, in order to give it the consistency necessary for the accomplishment of its "vital" functions; in the second, it may simply be necessary to find in the patient the "non-operative" thought which existed before the symptomatic onset. Be that as it may, the two hypotheses show fairly well in **Marty's theory**, on the one hand the preponderant part which returns to the psyche in the balance of the somatic sphere, and on the other the epistemological foundations of this approach, partly rooted in the conception of a psychic "lack" that should be filled, restored or even "reanimated".

Pierre Marty proposes an approach to the processes of somatization in which he expresses that "psychosomatic science, whose breadth is due to the fact that it contains psychoanalysis from which it is moreover the result, also encompasses knowledge of medicine, physiology, biology "(Marty, 1981). According to this author, the process of somatization consists of the discharge of excitation - normal to human functioning - which fails to develop mentally or to take the path of behavior, uses the somatic path and "sooner or later reaches the apparatus. Somatic and neuronal pathologically "(Marty, 1991). (Stora, 2012) sums up Marty's approach by presenting two types of somatization: Regression somatization, which corresponds to previous functional fixations and manifests as "seizure" diseases such as asthma, eczema or ulcer. Somatization by progressive disorganization, which seems to affect mainly more fragile subjects suffering from behavioral neuroses and result in cardiovascular diseases, autoimmune diseases, cancers, which are life-threatening.

The theoretical research undertaken by the School of Paris is in fact coupled with constant practice with "psychosomatic" patients. The therapeutic aim of this practice confers on the "psychic factor" which is at stake, the status of an "object" of care - in the literal sense of the term. This "psychic factor" - renamed in this case "psychosomatic" - is de facto transmuted into a factor involved among others in the development of a disease. It is in any case on these bases that (Dejours, 1989) formulates the definition of this "medical specialty", considered as "specific

reading of the disease that we are entitled to propose as well as in cancer, one can simultaneously provide an immunological reading, a virological reading, a cytological reading, a biochemical reading (or) a biophysical reading ".

There are, however, some significant nuances in some of this author's proposals to distinguish them from all of the proposals of the school he claims to be. While retaining to its own theoretical proposals the importance that the Paris school gives to the economic dimension of psychic functioning, (Dejours, 1989), for example, gives back to the "libidinal" a place which seemed a little lost sight of any case in the official school productions. Without speaking about it as a new concept, let us note, however, that the idea put forward here by (Dejours, 1989) has the merit of underlining the still current edge of Freudian teaching.

To the notion of shoring, (Dejours, 1989) suggests adding that of "subversion". He indicates in this way that if the physiological function is diverted from its primary purpose, it is in reality the whole of the "biological body" which is reached by this diversion, in favor of the constitution of the "erotic body". Subversion is understood here as the "reversal" of an established order - that of biological laws - in favor of another order (or of a disorder) - that of the libidinal economy -: "Thanks to this construction from psychic sexuality, and from the erotic body, the subject manages to partially free himself from his physiological functions, his instincts, his automatic and reflex behaviors, even his biological rhythms ".

As for the repercussions of these conceptual adjustments, they concern above all the psychosomatic clinic, which "indeed suggests that when certain disorders of psychic functioning occur, which alter the economy of the erotic body, a risk of somatic disease appears at the same time". The hypothesis then formulated by (Dejours, 1989) is that, "if the libidinal subversion does not, strictly speaking, grant an additional solidity to the physiological functioning, in any case the stripping, for its part, seems relatively dangerous for the health of the body"

In other words, and although advocating the absence of a "hierarchy of functions", (Dejours, 1989) nonetheless describes a general process, during which the destabilization of one (the psychic function) can lead to disorders for the other (biological function). Despite the evolutionist dimension of their theoretical anchoring (dimension which allows a certain flexibility with respect to the structural model itself), it therefore seems difficult for the inventors of "psychosomatics" to really distance themselves from a medical model from which they are finally issued. Has the "second generation" of psychosomatic practitioner-researchers succeeded in forging a model different from that of their predecessors.

3-9- McDougall- Sami-Ali Theory (1989)

From a certain point of view, (Mc Dougall, 1989) work could very well not be disowned by his Lacanian colleagues. Particularly vigilant to the bodily manifestations of his analysands, Mc Dougall indeed supposes that psychosomatic affection does not at first sight reveal "any neurotic or psychotic conflict", because its "meaning is of a presymbolic order and bypasses the word representation". But on the other hand, and while lending everyone (including the analyst) the possibility of "somatizing" one day or another, (McDougall , 1989) discovers - in some patients only - that falling ill is a "capacity" or even a skill, in times of crisis, allowing them, thanks to the experience of their bodily limits, "to ensure a minimum of existence separated from any other significant object".

Without proposing a real typology, (Mc Dougall, 1989) nonetheless describes about ten psychic characteristics most frequently observed in subjects with a "somatizing tendency"; we will retain the two main ones. First of all, its structural dimension: the degree of psychic structuring has enabled the subject to pass the stage of Oedipal resolution without hindrance, and the relational life which results from it appears socially and sexually "normal". Second, the subject is unconsciously the bearer of "immature" parental images formed in childhood, which make him incapable of appropriating all of his functions of empowerment, whether psychic or physiological. It is in this double context that the precocious "psychosomatic vulnerability" appears, attesting to an autonomy that is either premature or too late. Without really contradicting (Mc Dougall, 1989) theses, (Sami-Ali,1987) built a theoretical edifice about somatization, founded above all on the reference to the function of the imaginary, but in its relation to the real, the one and the another of these "constituents" of psychic life revolving around projection.

The objective that (Sami-Ali, 1987) set for himself in his theoretical endeavor aims nothing less than to access "a new problematic opening simultaneously to the psychic and the somatic", whose frame of reference remains exclusively psychoanalytic theory. For the author, it is explicitly a question of developing a "multidimensional model of somatization" which would make it possible "to account for the phenomena of somatization in all their extent" 47. In an extremely broad way - that is to say not centered on a specific symptomatology (Sami-Ali,1987) describes the psychic functioning of these patients as an imaginary dominated by repression. The paradigmatic model of such a functioning is provided to him by the testimony of Zorn

If the overall nature of the human organization is psychosomatic, only this particular dysfunction is likely to generate phenomena of "somatization". The "collapse" of the dreamlike function mentioned above by (Mc Dougall, 1989) recalls without difficulty the modification of which (Sami-Ali, 1987) speaks about the function of the imaginary: "the whole of psychosomatic

functioning (is) centered on the imaginary that are the dream and its equivalents. The psychic conflict disappears at the same time as the dream, leaving at the level of the conscious, a functioning grappling with the real. Therefore, neither neurosis, nor psychosis, but the most diverse character traits, intended to contain functioning in "normality" while insidiously creating the dynamic conditions for a pathology which can only be organic "

3-10- Psychosomatic and Heinroth Theory (1818)

Psychosomatic medicine is a vast field and its limits are often rather vague. The term psychosomatic diseases refer to organic, lesional conditions, the onset, aggravation or recurrence of which are linked, among other things, to the psychological functioning of the individual. For psychosomaticians, every disease has a psychosomatic component, from eczema to asthma, high blood pressure and autoimmune diseases. The term psychosomatics, coined by (Heinroth, 1818), indicates the connection between body and mind.

It seems accepted, empirically, that even the most benign disease often occurs at a time when the individual is particularly weakened, tired, overworked. An emergency doctor or general practitioner exposed to the flu and gastroenteritis virus all winter will not necessarily be infected. On the other hand, at a time when he will feel more tired, more weakened by stress, bereavement, separation, he will develop one of the diseases that he nevertheless encountered on a daily basis. Illness never seems to happen by chance. It breaks into the subject's life at a time conducive to somatization. This auspicious moment is a moment of psychic weakening. The psychic apparatus can no longer cope with tensions, excitations, and this state of psychic disorganization is the bedrock of somatization. The type of somatization obviously differs depending on the severity of the psychic disorganization, the predisposition of an individual to rather develop cancer, an allergy or a system disease, genetic factors, the type of virus or bacteria encountered.

To highlight the importance of the psyche / soma link, this work will focus on ulcerative colitis in children. Psychotherapeutic experiences with children or adolescents with this pathology are rare. These usually do not ask for psychotherapeutic help. It is therefore up to the family doctor, pediatrician or hospital doctor to encourage the child and his family to develop a reflection on the psychological aspect of his illness and to express a request for help. For this, the doctor in charge of the child, as well as his family, must be convinced of the merits of psychotherapeutic follow-up.

**PART II:
MATERIALS AND METHOD**

CHAPTER 4: METHODOLOGY

4-1- Introduction

The methodology discourse according to (Kallet, 2004) has as goal to “describe actions to be taken to investigate a research problem and the rationale for the application of specific procedures or techniques used to identify, select, process, and analyze information applied to understanding the problem, thereby, allowing the reader to critically evaluate a study’s overall validity and reliability.

4-2- Research design

Our study is a mixed research method, here we use both qualitative and quantitative data collection and analysis methods to answer our research question. This involves combining or integrating qualitative and quantitative research and data in a research study. Qualitative data tends to be open-ended without predetermined responses while quantitative data usually includes closed-ended responses such as found on questionnaires or psychological instruments. The field of mixed methods research is relatively new with major work in developing it stemming from the middle to late 1980s. Its origins, however, go back further used multiple methods to study psychological traits although their methods were only quantitative measures. (Creswell and Plano, 2007).

In this cross-sectional study, we collected data from seven subdivisions of the Mfoundi division, Yaounde the Capital City of Cameroon, from November 2018 to May 2019 (7months). Yaounde is situated at about 700–800 m above the sea and had a total population of 2,440,462 inhabitants in 2011. Consenting adolescents aged 6/7, adolescents 13/14 years, and guardians/parents of all age were considered for inclusion in the study. People with hearing and speech problems were excluded. Questionnaires were both in the French and English languages for written and video.

The children took the questionnaires home for their parents/guardians to complete. Upon return of the questionnaires, the heights and weights of the children were measured. The Convergent parallel mixed method was used. This is a form of mixed research methods design in which the researcher converges or merges quantitative and qualitative data in order to provide a comprehensive analysis of the research problem. In this design, the investigator typically collects both forms of data at roughly the same time and then integrates the information in the interpretation of the overall results. Contradictions or incongruent findings are explained or further probed in this design.

4-3- Population and sample of study

According to (Polit and Hungler, 1999), a population is referred to as an aggregate or totality of all the objects, subjects or members that conform to a set of specifications. In this study the population was Mfoundi Yaounde primary and secondary school children and their parents of all race, educational status and residential areas, requested information on the prevalence and severity of asthma. The compulsory age group was 13/14-year-old but not all questions are compulsory. The parent/guardians of the adolescents were strongly recommended for inclusion. Also, strongly recommended for inclusion were 6/7 years old children and their parents/guardians. The adolescent group completed a questionnaire about themselves at school and then will then took home adult questionnaires for their parents/guardians to complete about their own health. The younger age group also took questionnaires home for parent/guardian's completion a) about the health of their child and b) about their own health.

4-3-1- Study population

Written questionnaires for adolescent's study were from selected schools in Mfoundi division and a sample of 1066 adolescents recruited from school registers were invited to participate. The 6-minute nonverbal video questionnaire on asthma symptoms was watched by 1061 adolescents. This was watched by the student's following completion of the written questionnaire. Another strongly recommended component of this study was the recruitment of an additional 722 6/7 years old children. The children identified through school class registers, will took questionnaires home for parents/guardians to complete about their child. The video and its questionnaire were not be administered to this age group.

4-3-2- The target population

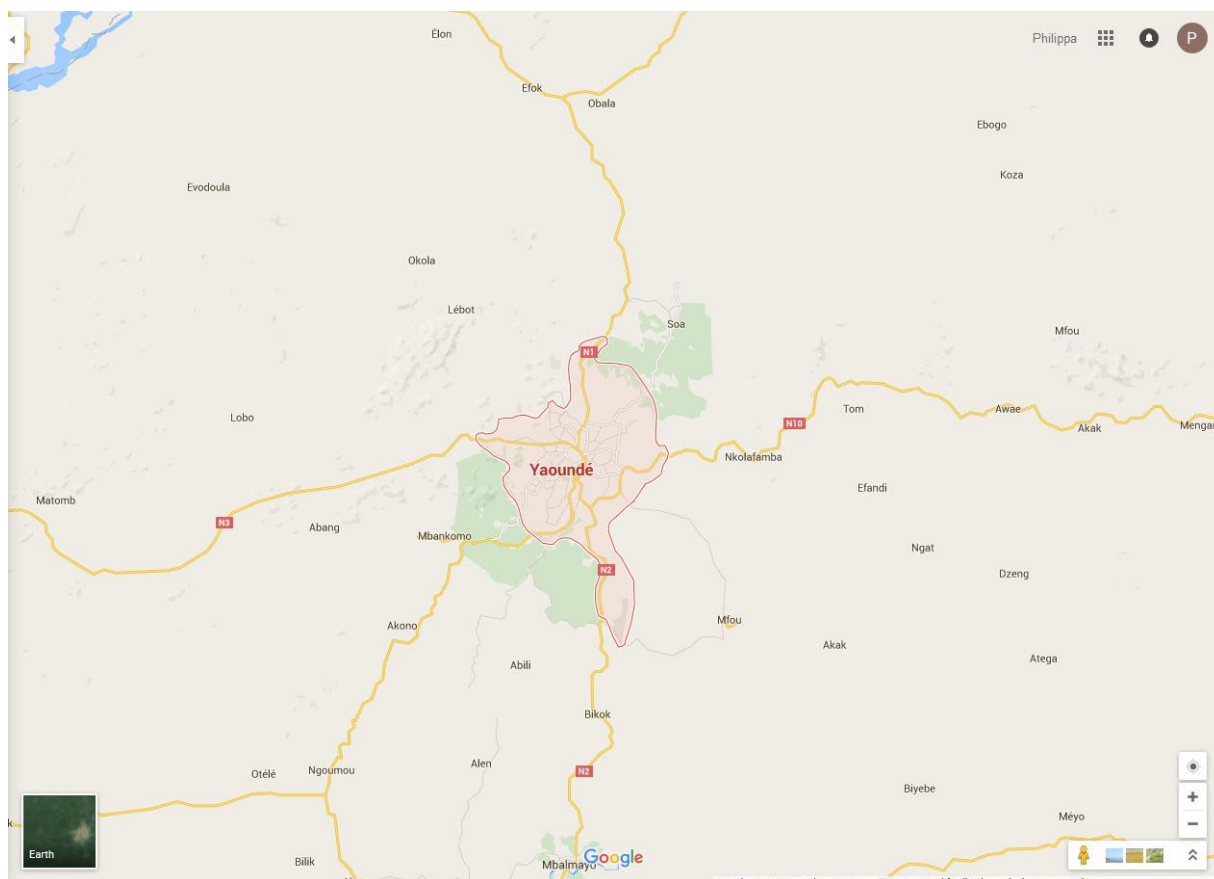
Consenting children aged 6/7 years, adolescents 13/14 years, and guardians/parents of all age was considered for inclusion in the study. A total of 1343 children 6/7 years, 1067 adolescents 13/14 years and 1606 parents/guardians of both the adolescents and children.

4-3-3 The accessible population

The 722 children 6/7 years were reached through passive consent, then we also reached 793 parents/guardians through passive consent by their child's school. The 1066 adolescent children were also reached through passive consent of school and then their 67 parents/guardians of the 6 schools that participated.

4-4- Study site

This cross-sectional study was conducted in the seven subdivisions of the Mfoundi Division in the Centre Region, Yaounde the Capital City of Cameroon, from November 2018 to May 2019 (7 months). Yaounde is situated at about 700–800 m above the sea and had a total population of 2,440,462 inhabitants in 2011.



Source: Google.com

Figure 1:
Map of study site in Mfoundi, Yaounde city Cameroon.

The study site is represented in red limitation as shown on figure 1, this is the Mfoundi Division also representing Yaounde city (Google 2015). This study was focused in the seven Sub Divisions of the Mfoundi Division the Yaounde city area (See Figure 1).

4-4-1- Presentation of the Centre Region

The Centre Region is one of the ten Regions of Cameroon. Situated in the center of the country. Its headquarters being Yaounde, which is also the capital of Cameroon. It has a surface area of 68 953km². The Region is situated in the center of the country, with an average altitude of 200 to 600 m², it is delimited by five Cameroon regions: East, Adamaoua, West, Littoral and the South. The Centre Region is comprised of 10 Divisions which are: Haute-Sanaga, Lekie, Mbam-et-Inoubou, Mbam-et-Kim, Mefou-et-Afamba, Mefou-et-Akono, Mfoundi, Nyong-et-

Kellé, Nyong-et-Mfoumou and Nyong-et-So'o. In 2015, the region had 5 000 000 inhabitants, and present in the Cameroon scale of average density of 44,9 hab./km².

4-4-2- Presentation of the Mfoundi division in the Centre Region

The Mfoundi Division covers a surface area of 287 km² situated in the Centre Region of Cameroon. With headquarters being Yaounde which is also the capital city of Cameroon. The division was created following decree n°74/193 of 11 March 1974 separating it from the Mefou Division (Today itself divided into Mefou-et- Afamba and Mefou-et-Akono). The Division is made up of only one urban council:

The Yaounde Urban Council: The urban council has no elected mayor, but a president (delegated by the government). Meanwhile each of seven Subdivisions has an urban sub divisional council elected with a mayor of each urban subdivision. The urban council covers the whole Division, in effect a collectivity with particular status. The department is made up of 7 subdivisions: Yaounde I(Nlongkak), (Etoudi), Yaounde II(Tsinga), Yaounde III(Efoulan), Yaounde IV(Kondengui), Yaounde V(Essos), Yaounde VI(Biyem-Assi) and Yaounde VII(Nkolbisson).

4-4-3 Primary schools in the Mfoundi Division involved in research

Our research was focused on 27 primary schools randomly selected schools within the Mfoundi Division. The primary schools were randomly selected from all seven subdivisions. There were both private and public schools involved. The primary schools were selected from all socioeconomic status. Here are the schools that participated in the study from TABLE V;

**TABLE V:
Primary schools in the Mfoundi Division involved in study**

N°	Name of Primary Schools	Location
YAOUNDE I		
01	Government Bilingual Primary School Mballa II	Mballa II
02	Government Bilingual Primary School Bastos	Rond point Bastos
03	ASEC Primary school	Etoudi
04	Groupe Scolaire Bilingue les Martinets	Mballa II
05	Groupe Scolaire Internationale Les Fleurettes	Valley Nlongkak,
06	Complex Excellence	Nyom
07	Elite School	Nyom
08	Complexe International la Giete	Nlongkak
YAOUNDE II		
09	Ecole Publique Cite Vert	Cite verte
10	Ayungha Primary School	Carrier

11	Refuge Primary School	Carrier
12	Dumasi Bilingual Primary School	Carrefour Carrier
YAOUNDE III		
13	Ecole Publique Camp Genie	Quartier-General-Military Camp
14	Ecole Public Administrative	administrative zone
15	Government Bilingual Primary School	National Institute of Statistics
16	We Care Primary School	Damas.
YAOUNDE IV		
17	Ecole Publique de Nkomo	Nkomo
18	Complexe Noula Primary school	Awea
YAOUNDE V		
19	Ecole Publique Mfandena II	Omnisport
20	Ecole Public Ngoulmekong	Fugerol
YAOUNDE VI		
21	Ecole Public de Biyem-Assi II	Sources Biyem Assi
22	Government Bilingual Primary School	Biyem Assi hospital,
23	Ecole Public Biyem Assi	Acacia
24	Jordan Bilingual Primary School	Biyem Assi Before Acacia
25	St Francis Primary school	Carrefour Obili.
YAOUNDE VII		
26	Government Bilingual Primary School	Nkolbisson Roundabout
27	Genius Centre Primary School	Nkolbisson

Source: Field work

4-4-4- Secondary schools involved in the seven subdivisions of Mfoundi

Our research was focused on 22 randomly selected secondary schools within the Mfoundi Division. The secondary schools were randomly selected from all seven subdivisions. There were both private and public schools involved. The secondary schools were selected from all socioeconomic status. Here are the schools that participated in the study (See TABLE VI);

TABLE VI:
Secondary schools in the Mfoundi Division involved in study

N°	Name of Secondary School	Location
YAOUNDE I		
01	Lycée de Mballa II	Mballa II
02	Christian Comprehensive Secondary School	Nkolmbong
03	College Technique Ngilland	Nyom
04	Institute Matamfen	Rond Point Nlongkak
05	International Complex 'La Gaiete'	Tradex bastos
YAOUNDE II		
06	Lycée de Cite Vert	Cité vert
07	Comprehensive Bilingual High School Ayungha	Carrier
08	Marcelin Secondary School	Carrier
YAOUNDE III		
09	Lycée de Ngoa Ekele	Ngoa Ekele
10	Lycee de Nsam Efoulan	Efoulan Lac
11	We Care Secondary school	Damas
YAOUNDE IV		
12	Baptist Secondary School	Awea
13	INSTITUTE PETOU	Ekie
YAOUNDE V		
14	Government Bilingual High School	Carrefour Essos
15	Lycee de Ngoussou/ Ngolmekong	Fugerol
16	College Mongo Beti	Mobile Essos
17	Institute Mbeukam	Chapel Ngoussou
YAOUNDE VI		
18	Government Bilingual High School	Etougebe
19	Lycee Biyem Assi	Biyem Assi
20	Francky Academy	Biyem Assi biscuiterie
YAOUNDE VII		
21	Lycee de Nkolbisson	IRAD Nkolbisson
22	Genuis Trilingual College	Karamba Nkolbisson

Source: Field work

4-5 Sampling and technique

4-5-1 Sample

A sample is a subset of a population selected to participate in the study, it is a fraction of the whole, selected to participate in the research project (Brink 1996:133; Polit & Hungler 1999:227). This is the selected elements (people or objects) chosen for participation in a study; people are referred to as subjects or participants. Our sample is constituted of 722 children 6/7 years of age and 793 adults being children's parents and guardians, 1066 adolescents 13/14

years of age and 67 parents of adolescents. We decided to work with children 6/7 years and their parents and adolescents 13/14 years of age and some of their parents.

4-5-2 Sampling technique

Stratified random sampling when population is divided into subgroups, called strata, according to some variable or variables in importance to the study. Variables often used include: age, gender, ethnic origin, SES, diagnosis, geographic region, institution, or type of care. A disproportional approach of stratification is used in which a subgroup sample size is not equal to the proportion of the subgroup in the population. For our study a multilevel stratified random procedure was used to select participants for inclusion in this study.

The first level consisted of randomly selecting all enumeration Sub-division (ESD) from a total of 7 in Yaounde, based on a ratio of 1–7 ESD per district. ESD delineation was used based on the last general population census conducted in Cameroon in 2005. At the second level, at least two schools in five were selected using a systematic sampling (sampling step = 2). The number of schools per ESD ranged from 5 to 10 for each age group. At the third level all children aged 6/7 years and 13/14 years old were selected from primary and secondary schools. The fourth level had the parents/guardians of all children been contacted. Schools were randomly selected from each sub division on the bases of writing to the school authorities. At least 5 schools for each age group will make a total 50-60 primary and secondary schools. Within the Yaounde capital city.

All consenting participants were included in the study. Data collection used a questionnaire derived from those of the Global Asthma Network (GAN) Phase I Manual. Global Surveillance: Prevalence, Severity, Management and Risk Factors. Questionnaires were completed by trained field workers who were all Master students from the University of Yaounde I and other Higher Institutions of Learning. Socio-demographic details included were; sex, age, name of school, date of birth, date of answering, and optional question on region of origin and ethnic group, and the number of individuals per bedroom in the household.

4-5-3 Size of sample

A general rule of the thumb is to always use the largest sample possible. The larger the sample the more representative it is going to be, smaller samples produce less accurate results because they are likely to be less representative of the population (LoBiondo-Wood & Haber 1998:263-264). Our sample size for this research is 2648 children 6/7 years of age, adolescents 13/14 years of age and adults.

4-5-5 Criteria for selection

In order to implement this work, a population was selected following specific criteria. These refers to school children 6/7 years of age and adolescents 13/14 years of age al. The parents of children 6/7 years were all included while few parents of adolescents 13/14 years of age were included. All children and adolescents schooled in the seven subdivisions of the Mfoundi Division in Yaounde capital city.

4-5-4- Criteria of inclusion

We have two criteria for inclusion which are: must be school children currently in school within one of the seven subdivision and being aged 6/7 years of age or 13/14 years of age at the time of data collection in school.

4-5-5- Criteria of exclusion

The exclusion criteria of participants were based on age not being within the range, schools of children with disability and school authority rejected study.

4-6- Data collection instruments

The instruments used were questionnaires. The international questionnaires were updated to consider realities in Yaounde. Pre-coding the office use only boxes was done before questionnaires were printed. The questionnaires were completed both in school for 13/14 years while children 6/7 years and adults at home. The height and weight measurements strongly recommended for both the 6/7 years and 13/14 years old were measured using the scale balance and stadiometer. These measurements were taken at school after the written and video questionnaires had been completed and was noted on the questionnaire which measurement was used. This gave the fieldworkers the opportunity to check the demographic data had been completed correctly.

4-7 Validity and reliability

4-7-1 Validity

The height protocol instrument required was a portable calibrated stadiometer. Measurements are taken on a hard surface. As only one measurement of height is taken it is very important that the protocol is adhered to. The perpendicular distance between the top of the head (the vertex) and the bottom of the feet.

The weight protocol instrument required was a calibrated weighing scale. The weight is the force the matter in the body exerts in a standard gravitational field. Setting the scales was be to Place the scales on a hard-flat surface.

4-7-2 Reliability

The Height Protocol was done by asking the participant to stand on the centre of the base with their back to the stadiometer. Ask them to put their feet together and move back until their heels touch the bottom of the stadiometer upright. Their buttocks and upper part of their back should also be touching the stadiometer upright. Their head does not have to touch the stadiometer. The participant's head was to be in the Frankfort plane. This is achieved when the lower edge of the eye socket (the Orbitale) is horizontal with the Tragon (see Figure 2). The vertex will be the highest point on their head. If their head is not aligned properly, (and for most participants it probably won't be), ask them to raise or lower their chin until it is in the Frankfort plane. Comments or instructions to participants was to be to: "Please stand on the centre of the base with their back to the stadiometer. They put their feet together and move them back until their hells touched the back of the stadiometer. Stand up straight and look straight ahead." (*If their head is not horizontal, say...*) "Please raise (or lower) your chin. Take a deep breath and hold it. That's fine you can breathe normally now and step away from the stadiometer".

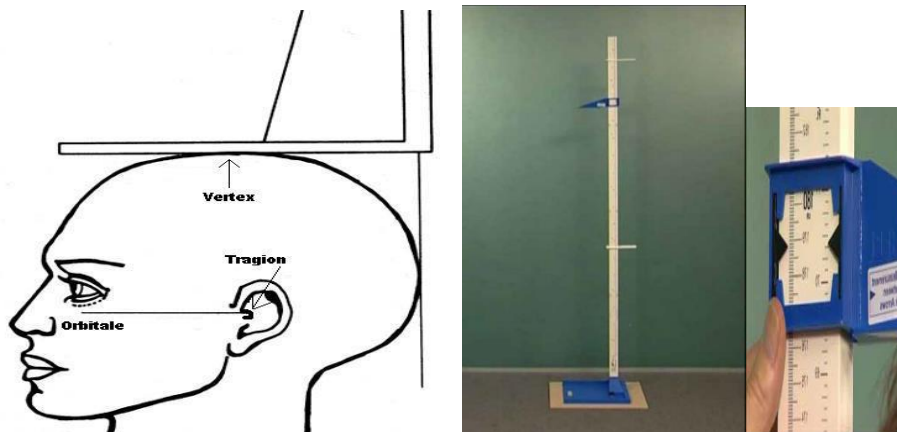


Figure 2 :
Head in the Frankfort Plane

Source: Adapted from the ISAK Manual, 2001.

The weight protocol given that only one measurement was taken, it was important that this protocol is adhered to. Press firmly on the centre of the scales to turn them on. Once the zeros appear, the Participants were asked to stand on the scales. The participants were asked to on the centre of the scales without support, with their arms loosely by their sides, head facing forward and with their weight distributed evenly on both feet. A reading will appear in a few seconds. The numbers will change, and then stop. Once the numbers had stopped, **the readings were taken to the nearest 0.1 kg.** (Figure 2).

The participants were asked to step off the scale. The recording was recorded the

on the questionnaire and measurement marked in (kilograms). The comments and instructions to the participants was to wait until it reads zero. “Please step onto the centre of the scale with your weight on both feet”. “Relax”. The premise of the data is to provide global estimates of the body/mass index relationship from the weights to the burden of asthma among children, adolescents and adults in Yaounde.

4-8 Data collection procedure

Particular importance was given to the quality of the data collection and procedures to ensure confidence in the results. The key issues in the procedure include the geographical definition of Yaounde and schools involved, the method of sampling of schools and children, participation rates, data entry, the details regarding the method of translating the core questionnaire into French and back to English. A participation rate of at least 80% for adolescents and 70% for children and adults was expected. In figure three we represent the school numbering and coding of each questionnaire.

This study is in collaboration with the Global Asthma Network (GAN). GAN has collaborators from 383 centres in 137 countries all of whom who answered the call for an Expression of Interest (EOI). Of the EOIs, 136 centres in 58 countries registered to participate in GAN Phase 1 including Yaounde Centre. GAN Phase 1 is a cross-sectional, multi-centre, multi-country study. Its methodology has been described and justified elsewhere and detailed in an online manual. Each centre was required to obtain approval from their local ethics committee prior to the start of their study.

Briefly, each GAN centre is based on a defined geographical area, within which a minimum of 10 schools were selected at random (or all schools, if less than ten). All students of a specified age within these schools were studied, selected by grade/level/year, or by chronological age. The sample size estimates of 1000-3000 are stringent because of the number of hypotheses being tested, and high response rates are sought. Two age groups of school pupils participated: adolescents and children. Translations into the local language were required and centres followed the ISAAC protocol for translation, back translation to English, and comparison between the two.

The compulsory age group was adolescents, who self-completed written questionnaires at school. Additionally, in some Yaounde, the ISAAC international video questionnaire showing different scenes of asthma in children of a variety of ethnicities was shown. All adolescents that participated watched the video in school just before weight and height measurement mostly in small groups using laptops due to power challenges in almost all 22 schools that participated.

This optional parental questionnaire obtained information on the prevalence of asthma, symptoms among adults, plus questions on asthma management and risk factors. The adult symptoms questionnaire combined items from ISAAC and the European Community Respiratory Health Survey (ECRHS) to cover the range of chest symptoms and diagnoses that might be related to asthma in young and middle-aged adults.

4-9 Data treatment instrument.

Data from Yaounde centre was submitted to the GAN Global Centre (Auckland, New Zealand) together with a descriptive centre report. Following initial quality control checks in Auckland, the data were transferred to one of the two designated GAN Phase 1 data centres for checking and analysis: London (United Kingdom), for centres using all other languages. A harmonized approach to data processing, checking and analysis was developed, using Stata versions 13-15. The denominator was the number of school-aged respondents (index children) to whom an adult questionnaire was distributed. The numerator was the number of index children for whom one or more adult questionnaires were returned. For centres which distributed adult questionnaires to both age groups of children, the numerators and denominators were combined to derive a single estimate of adult questionnaire response rate.

All consenting participants were included in the study. Data collection used a questionnaire derived from those of the Global Asthma Network (GAN) Phase I Manual. Global Surveillance: Prevalence, Severity, Management and Risk Factors. Questionnaires were completed by trained field workers who were all Master students from the University of Yaounde I and other Higher Institutions of Learning.

Data collection on breathing related to asthma and asthma symptoms was include: asthma diagnosed by a health professional, asthma crisis in the last twelve months, chest wheezing at any time, effort related wheezing, severity of wheezing in the last twelve months (number of wheezing, number of times awaken by wheezing, wheezing episodes with inability to speak out one or two words consecutively), awakening due to tightness, awakening due to attack of breathless, awakening due to cough, night-time dry cough in the absence of flu and chest infection, current medication intake for asthma.

4-10 Ethical consideration

For our research we obtained Ethical Approval from the Centre Regional Delegation of Public Health through the Centre Reginal Ethics Committee for Human Health research that covered the period of the study; **04th October 2018. Reference CE N°00840/CRERSHC/2018.** There was consent at three levels, first at the level of parents of children 6/7 years by writing with questionnaires so they have the clear option to participate or reject by returning questionnaire

through the child. There was consent request from parents of adolescents 13/14 years old through the school by writing.

The ethics clearance was followed by authorizations from the Regional Delegate of Secondary Education, Divisional Delegate of Education and Principals of different secondary schools. There was also authorization from Regional Delegation of Basic Education, followed by that from Divisional Delegate of Education, and Inspectors of education in all seven Sub Divisions. Then the head teachers of all schools gave instructions for class teachers to accompany study to success.

The symptoms applicable to our study were not equally distributed among children, adolescents and adults. The asthma written questionnaire was done for children, adolescents and adults. The asthma video questionnaire to better understand symptoms of asthma through qualitative questionnaires was done only in the adolescent's age group (see TABLE VII).

TABLE VII:
Symptoms applicable (YES) and NA Not applicable from data collection (Module not included for age group)

GAN Phase I Yaounde			
Questionnaire Module	6-7	13-14	Adults
Symptoms			
Asthma(written)	YES(1)	YES(1)	YES(1)
Asthma(Video)	NA	YES(2)	NA
Risk factors			
Environmental questions	YES(4)	YES(5)	YES(3)
Active smoking	NA	YES(6)	YES(4)
Perinatal questions	YES(5)	NA	NA
Indoor environment	YES(6)	NA	YES(5)
Asthma-related			
Management(now)	YES(7)	YES(7)	YES(6)
Management(infancy)	YES(8)	NA	NA
School absence	YES(9)	YES(8)	YES(7)
Work absence	NA	NA	YES(8)
Hospitalisation	YES(10)	YES(9)	YES(9)
	10	9	9

Source : Field work

CHAPTER 5: PRESENTATION OF RESULTS

5-1 Presentation of findings in Yaounde

A total of 1,341 children and 1067 adolescents from 49 schools were asked to participate in the study (see TABLE VIII). The actual number of participants was 722 children aged 6-7 years (53,8%), 1066 adolescents aged 13-14 years (99,9%) and 860 adults (34,6%). Table 6 represents the symptoms observed in this study among children, adolescents and adults.

TABLE VIII:
Symptoms from data collection on asthma with Non-Applicable areas of questionnaire.

Asthma symptom's	Questionnaire Module			
	6-7 (%)	13-14 (%)	Adults of 6-7 (%)	Adults of 13-14 (%)
Trouble with wheezing ever or current (ADBRTHEV)	12,2	25,4	17,9	27,3
Wheezing attacks in last 12 months (NWHEZ12)	18,9	20,2	10,3	29,2
Sleep disturbed in last 12 months (AWAKE12)	19,6	22,4	15,7	25
Breathless when wheezing noise was present (ADBRTHLS)	NA	NA	10,1 %	20,8
Sleep disturbed due to shortness of breath in last 12 months (ADWOKE12)	NA	NA	14,7	25
Severe wheeze in last 12 months (SPEECH12)	9,0	12,4	9,3	4,0
Asthma ever (ASTHMAEV)	1,8	5,3	3	1,5
Asthma confirmed by doctor (ASTHDOC)	9,6	5,4	11,8	6,3
Written asthma plan (ASTHPLAN)	6,3	4,1	8,8	5,1
Attack of asthma in last 12 months (ASTHMA12)	NA	NA	3,8	0
Inhaled medicines in last 12 months (MEDPUFF)	7,5	6,4	8,3	0

Source: Field work

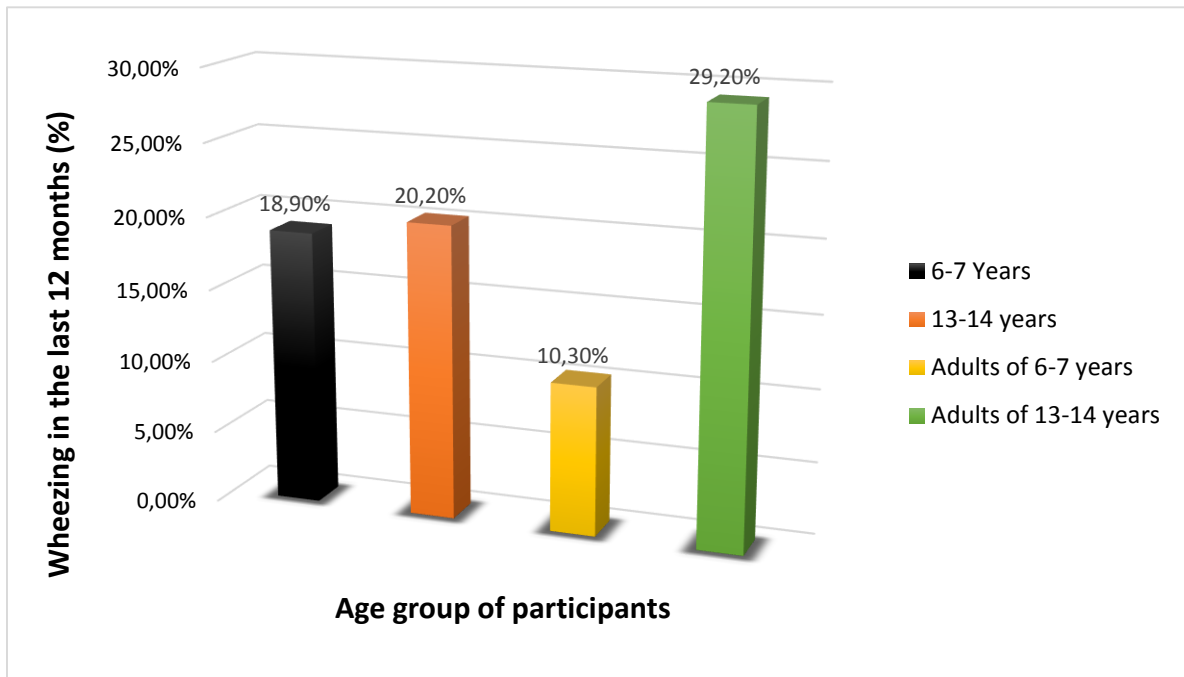


Figure 3:
The prevalence of wheezing ever percentage among children (6/7), adolescents (13/14) and adults in Yaounde.

The prevalence of wheeze ever was lower among children (see Figure 3). With 12.20%, we noticed a significant increase among adolescents with 25.40% being affected, and a slight fall among adults. In adults the prevalence was 17.90% in adults of children 6/7 years old, but increased significantly to 27.30% in adults of adolescents 13/14 years. This significant increase in adolescents of 13/14 was mainly due to the sample size being very small (only 67) to present evidence on real prevalence and severity in this age group.

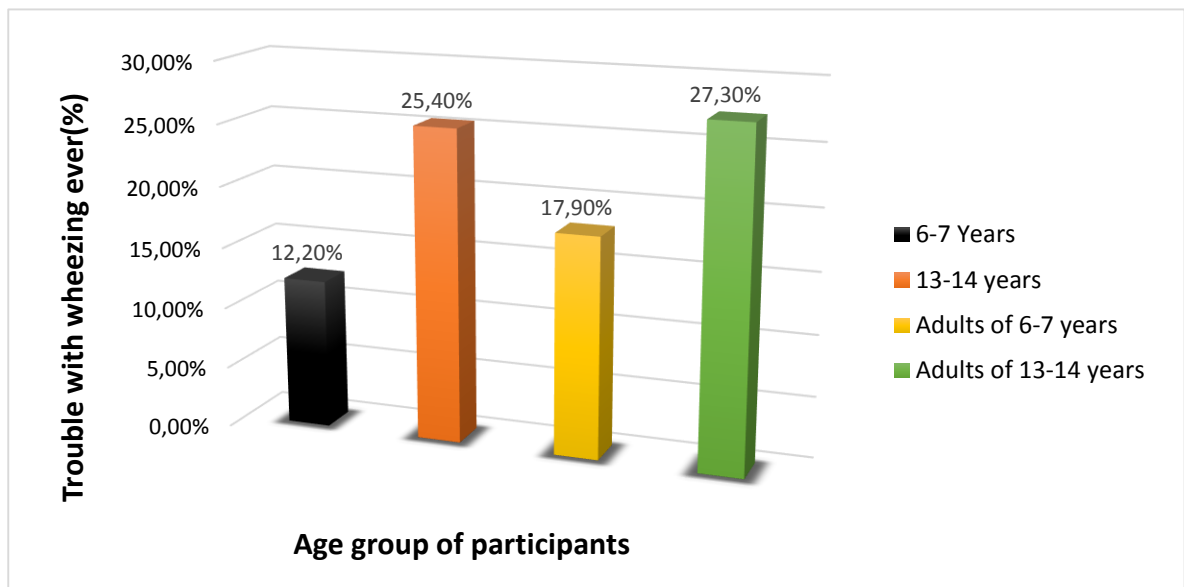


Figure 4:
The prevalence of wheezing percentage in the past 12 month's among children (6/7), adolescents (13/14) and adults in Yaoundé.

The prevalence of wheeze in the past 12 months was significantly high among children (see Figure 4). With 18.9%, we noticed a slight increase among adolescents with 20.2% being affected, and a sharp fall among adults. In adults the prevalence was 10.3% in adults of children 6/7 years old, but increased significantly to 29.2% in adults of adolescents 13/14 years.

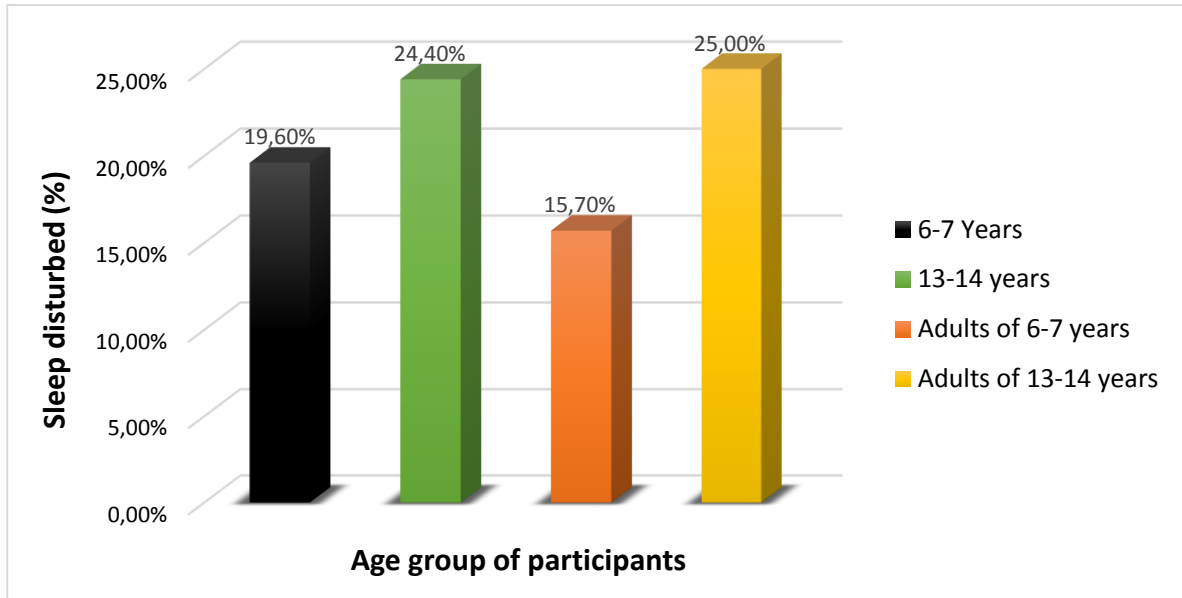


Figure 5:
The prevalence of sleep disturbed by wheeze percentage among children (6/7), adolescents (13/14) and adults in Yaoundé.

The prevalence of sleep disturbance due to wheezing among children (see Figure 5) was 19.6%, we noticed a significant increase among adolescents with 22.4% being affected, and a sharp fall among adults. In adults the prevalence was 15.7% in adults of children 6/7 years old and 25.0% in adults of adolescents 13/14 years.

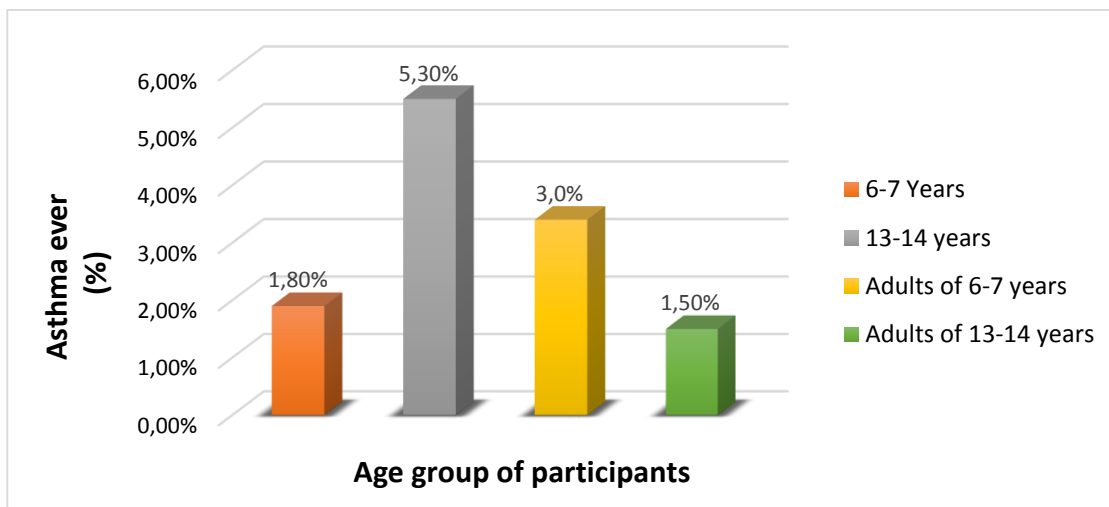


Figure 6:
The prevalence of Asthma ever percentage among children (6/7), adolescents (13/14) and adults in Yaounde.

The prevalence of asthma was low among children (see Figure 6), with 1.8%, we noticed a significant increase among adolescents with 5.3% being affected, and a sharp fall among adults. In adults the prevalence was 3.0% in adults of children 6/7 years old and 1.5% in adults of adolescents 13/14 years. This significant drop in adolescents of 13/14 was mainly due to the sample size being very small (only 67) to present evidence on real prevalence and severity in this age group.

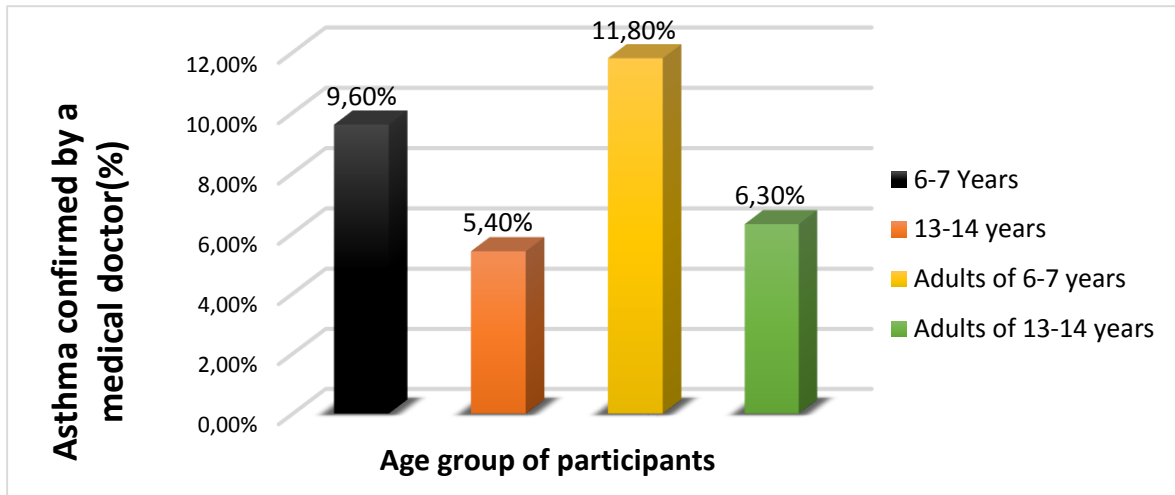


Figure 7: The prevalence of asthma confirmed by a doctor percentage among children (6/7), adolescents (13/14) and adults in Yaounde.

The prevalence of asthma confirmed by doctor among children was 9.6%, we noticed a significant decrease among adolescents with only 5.4% being confirmed by a doctor (see Figure 7), and a sharp increase among adults. In adults the prevalence was 11.8% in adults of children 6/7 years old and 6.3% in adults of adolescents 13/14 years. This significant decrease in adolescents of 13/14 was mainly due to the sample size being very small (only 67) to present evidence on real prevalence and severity in this age group.

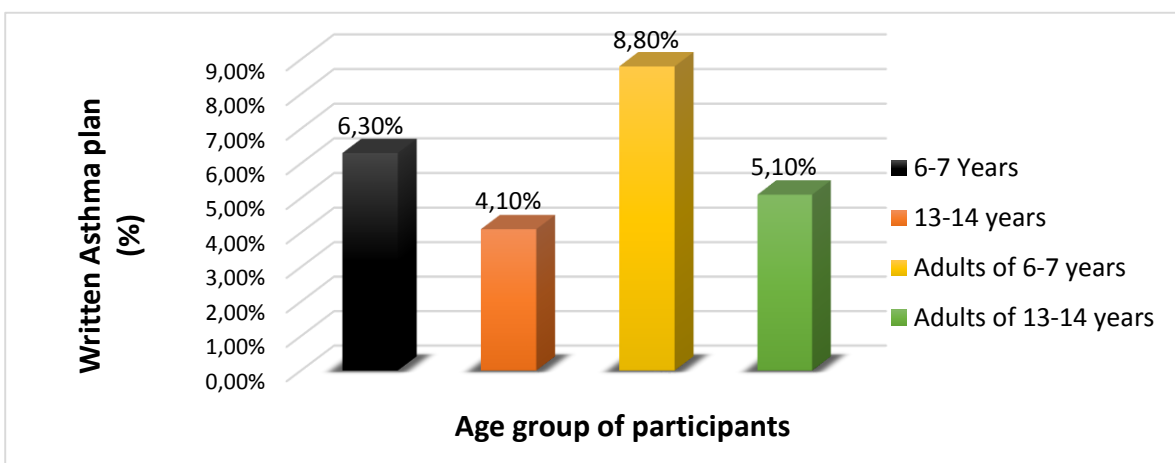


Figure 8: The prevalence of asthma plan use percentage among children (6/7), adolescents (13/14) and adults in Yaounde.

The prevalence of asthma plan use among children was 6.3%, we noticed a significant decrease among adolescents with only 4.1% with an asthma plan (see Figure 8), and a sharp decrease in adults of adolescents 13/14 years. This significant decrease in adolescents of 13/14 was mainly due to the sample size being very small (only 67) to present evidence on real prevalence and severity in this age group.

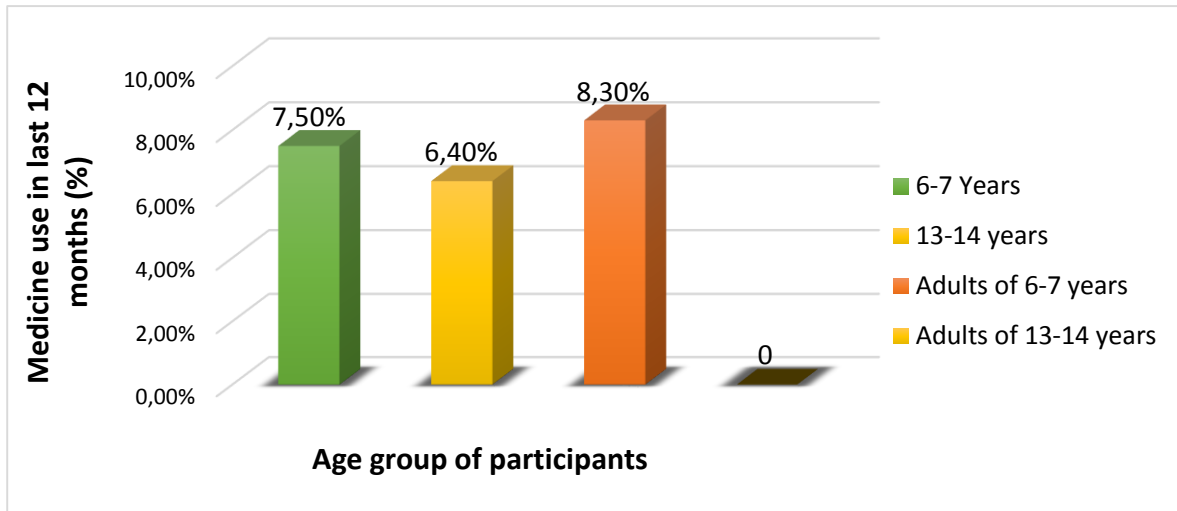


Figure 9:
Medicine use percentage among children (6/7), adolescents (13/14) and adults in Yaounde.

The prevalence of medicine use among children was 7.5%, we noticed a significant decrease among adolescents with 6.4% inhaling medicines (see Figure 9), and a sharp increase of 8.3% in adults of adolescents 6/7 years. There was no information on adolescents of 13/14, mainly due to the sample size being very small (only 67) to present evidence on real prevalence and severity in this age group.

5-1-1- Asthma video questionnaire only by adolescents 13/14 years.

There was 17.5% of adolescents that had breathlessness. In the past 12 months 17.3% confirmed to have had breathings difficulties. While 14.1% of adolescents had regular breathlessness. There was high level of breathlessness after exercise 46.1%, there was a breathlessness slight drop of 40.5% after exercise in the past 12 months and 32.6% had regular breathlessness after exercise. 8.3% of adolescents woke up in the night due to breathlessness, and there was an increase in breathlessness by 9.1% in the past 12 months and 6.9% regularly woke up at night. 12.7% of adolescents had breathing difficulties, 12.3% had breathing difficulties during the past 12 months, while 11.9% of adolescents had breathing difficulties regularly.

5-2- Environmental risk factors in children, adolescents and adults.

5-2-1- Environmental Risk factors in children 6-7 years.

5-2-1-1- Perinatal conditions of children

The use of paracetamol during pregnancy was 32.5% of children often exposed to paracetamol from their mother during pregnancy, while 13.5% were exposed once a month, and 21.7% were exposed at least once during pregnancy. We noticed that 17.3% of children were exposed to farm animals during pregnancy. Only 3(0.4%) of mothers smoked during pregnancy. The use of carpets inside homes was significant. Few mothers had carpets in the bedroom with 18.1%, but a sharp increase of 40.7% of carpets in the living room, while there was a drop in other rooms by 10.9%.

5-2-1-2- Postnatal conditions of children

In children 6-7 years the mean weight was 23.96kg and mean height 1.19m. A very high number of children born prematurely of 3.3%, with a corresponding mean birth weight of 3.46kg(see TABLE IX).

**TABLE IX:
Postnatal conditions in children**

Postnatal conditions	Impact in children	Percentage (%)
Breastfeed	Ever breastfeed	51.1
	Breastfeed for more than 6months	22.0
Drunk milk	Mostly drunk milk at age 1-6 months	77.0
	Drunk infant formula	5.2
Paracetamol use	Used paracetamol during first year of life	66.5
Chest infection	Chest infection problem during the first year of their life	15.7
Antibiotics use	Use of antibiotics in the first year of life	61.1
Visiting home care	visiting younger than 3 years	35.2
	Visiting older than 3 years	40.4
Physical activity	At least once per day	25.8
Watching television	For 5 hours or more per day	12.4
Computer use	For 5 hours or more per day	1.3
Prevalence of pneumonia	110 diagnosed	18.2

Source : Field work

5-2-1-3- Indoor conditions of children

There were 4.6% of children being twins. The mean number of older siblings were 1.72 and mean number of younger siblings being 1.07(see TABLE X).

TABLE X:
Indoor environment of children

Conditions in home	Impact on children	Percentage (%)
Exposure to truck pollution	Had frequent exposure to trucks pass through the street	20.7
Cat in home	Were exposed to a cat at home in the last 12 months	19.3
Dog in home	Were exposed to a dog at home in the last 12 months	13.8
Paracetamol	Used paracetamol at least once per month	50.3
Consumption of meat	Consumption of meat in the last 12 months once or twice per week	62.7
Seafood consumption	Consumption of meat daily	16.9
	Seafood consumption in the last 12 months	53.8
Fruit consumption	Seafood consumption during most or all days	32.8
	Consumption in the last 12 months	46.3
Cereal consumption	Consumption once or twice per week	38.8
	Consumption in the last 12 months once or twice per week	34.4
Bread consumption	Consumption most or all days	35.9
	Consumed in the last 12 months once or twice per week	21.3
Milk consumption	Consumed most or all days.	71.0
	Consumption in the last 12 months once or twice per week	39.1
Eggs consumption	Consumption most or all days.	35.6
	Consumption in the last 12 months once or twice per week	59.4
Consumption of sugar	Consumption most or all days.	24.5
	Consumption in the last 12 months once or twice per week	44.5
Consumption of fast food	Consumption most or all days.	32.6
	Consumption in the last 12 months once or twice per week	11.6
Consumption of soft drinks	Consumption most or all days.	3.1
	Consumption in the last 12 months once or twice per week	52.8
	Consumption most or all days.	13.9

Source : Field work

5-2-2 Asthma related management in children 6-7 years.

5-2-2-1 Asthma management now in children

From our study, 9.2% of children with asthma was confirmed by a doctor, and 6.3% had a written asthma plan. Meanwhile 7.5% of children with asthma used inhaled medicines in the last 12 months. The use of SBA in the last 12 months was 67.6% only when needed, 27.0% in short courses and 5.4% every day. The use of LABA in the last 12 months was 69.2% only when needed and 30.8% in short courses. The use of swallowed medicines in the last 12 months was 12.7%. The urgent visit of doctor in the last 12 months 6.8% for 1 to 3 visits, 1.6% for 4 to 12 visits and 0.4% for more than 12 visits. Children that had urgent Emergency Department visits in the last 12 months was 3.6% 1 to 3 times and 0.8% 4 to 12 times.

5-2-2-2 Asthma management (infancy) in children

Wheezing during first year of life was 5.3% in children. 7.1% of children took medicines during first year of life. The children that inhaled SABA during the first year of life was 64.3% only when needed, 21.4% in short courses and 14.3% every day. The children who used Inhaled corticosteroids during first year of life were 58.8% only when needed and 23.1% in short courses. The use of antibiotics during first year of life was 87.5% only when needed, 10.0% during short courses and 2.5% every day.

5-2-2-3 Asthma management and school absence in children

School days missed in the last 12 months by children was 6.7% for 1 to 3 times, 2.4% missed school between 4 to 12 times, meanwhile 1.2% missed school more than 12 times.

5-2-2-4 Asthma management and hospitalisation in children

Urgent doctor visit in the last 12 months was 6.8% between 1 to 3 times, 1.6% between 4 to 12 times and 0.4% more than 12 times. Urgent Emergency Department visits in the last 12 months was 3.6% between 1 to 3 times and 0.8% between 4 to 12 times. Hospitalisation in the last 12 months was 5.2% once, 2.8% twice and 1.2% more than twice.

5-2-3 Environmental Risk factors in adolescents 13-14 years.

5-2-3-1 Current conditions of adolescents 13-14 years

The mean weight of adolescents 13-14 years was 50.26kg and the mean height was 1.57m. Adolescents that participated 6.1% were twins, the mean number of older siblings was 2.23 mean while the mean number of younger siblings was 2.18(see TABLE XI). Among adolescents that participated, 88.9% were born in Cameroon the country of survey.

TABLE XI:

Environmental conditions of adolescents

Conditions in home	Impact on children	Percentage (%)
Physical activity	Never or occasionally doing	40.7

	sports	
	Doing sports once or twice per week	45.1
	Did sports three or more times per week	14.3
Watching television	For 5 hours or more per day	33.1
	For 3 hours but less than 5 hours per day	21.1
	1 hour but less than 3 hours	24.9
Use of computers	Less than 1 hour per day	20.8
	Less than one hour per day	44.3
	1 hour but less than 3 hours per day	27.2
Exposure to trucks	Spent 3 hours but less than 5 hours	12.9
	Spent 5 hours or more on the computer per day	15.6
	Exposed to trucks frequently through the day	22.7
Consumption of meat	exposed to trucks passing through the streets almost the whole day	12.1
	Once or all days in the last 12 months	22.9
Consumed seafood	During most or all days in the last 12 months	31.8
Fruits consumption	Most or all days in the last 12 months	41.5
Consumption of cereal	Most or all of the days in the last 12 months	40.7
Consumption of bread	Most or all of the days in the last 12 months	66.4
Consumption of eggs	Most or all of the days	28.5
Consumption of milk	Most or all of the days in the last 12 months	36.1
Consumption of sugar	Most or all of the days in the last 12 months	41.4
Consumption of soft drinks	Most or all of the days in the last 12 months	28.9
Consumption of paracetamol	At least once per month	60
Presence of pets at home	Cat at home in the last 12 months	36.0
	Dog at home in the last 12 months	34.0

Source : Field work

5-2-3-2 Active smoking in adolescents 13-14 years

The prevalence of active smoking among adolescents was high for this age group. There were 2.7% who smoked tobacco ever less than daily, meanwhile 1.0% smoked

tobacco daily. Current adolescent tobacco smokers were 1.2% that smoked less than daily meanwhile 0.4% smoked daily. The mean age adolescents started smoking tobacco in years was 10.53 and mean number of cigarettes per day was 1.76. The prevalence of shisha or water pipe smoked at home doubled in adolescents with 5.0% currently smoking shisha or water pipe tobacco.

5-2-4 Asthma related management in adolescents

5-2-4-1 Asthma management now in adolescents

The prevalence of wheezing among adolescents in the last 12 months was 27.8% and adolescents who had night cough in the last 12 months 40.6%. The prevalence of asthma was highest in this age group with 5.4% asthma cases confirmed by a doctor. Meanwhile 4.1% had a written asthma plan, and 6.4% inhaled medicines in the last 12 months. The use of SABA in the past 12 months was 5.8% for those who consumed every day, 13.6% for those who consumed in short courses and 80.6% consumed only when needed. The use of LABA in the last 12 months was 6.5% for those who consumed every day, 19.6% for those who consumed in short courses and 73.9% consumed only when needed. In adolescents with asthma, 7.9% used swallowed medicines in the last 12 months.

5-2-4-2 Asthma management and school absence in adolescents

The absence from school by adolescents in the last 12 months was 0.7% more than 12 times, 1.1% 4 to 12 times and 7.7% 1 to 3 times.

5-2-4-3 Asthma management and hospitalization in adolescents

The visit of doctors in the last 12 months by adolescents was 1.2% for those who visited the doctor more than 12 times, 1.3% for those who visited between 4-12 times and 8.4% between 1 to 3 times. The number of urgent Emergency Department visits were lower in adolescents, 0.5% more than 12 times, 0.3% 4 to 12 times and 6.0% 1 to 3 times. The rate of hospitalization within the last 12 months was 2.2% twice and 4.3% once.

5-2-5 Environmental Risk factors in adults.

5-2-5-1 Current conditions in adults of children 6-7 years

The adults that took part in this study were from different educational back grounds. There were 17.6% adults who had primary level education, 45.6% had secondary school education and 36.8% had university level education. The adults of our study consumed meat in differently in the last 12 months, with 18.3% consuming most or all days, 65.6% once or twice per week and 16.1% never or only occasionally. The consumption of seafood dropped with 29.7% during most or all days, 58.3% once or twice per week, and 12.0% never or only occasionally. There was an increase in fruits consumption by adults in the past 12 months

with 35.6% most or all days, 49.9% once or twice per week and 14.4% never or only occasionally. The consumption of cereal in the past 12 months dropped with 18.8% in most or all days, 36.1% once or twice per week and 45.1% never or only occasionally.

The consumption of bread increased in the last 12 months with 59.8% most or all days, 28.9% once or twice per week and 11.3% never or only occasionally. The consumption of milk in adults in the last 12 months was 22.2% most or all days, 46.6% once or twice per week and 31.3% never or only occasionally. The consumption of eggs in the last 12 months was 18.3% most or all days, 51.7% once or twice per week and 30.0% never or only occasionally. Sugar consumption in the last 12 months was 24.9% most or all days, 39.7% once or twice per week and 35.4% never or only occasionally. The consumption of fast food in the past 12 months was 4.2% most or all days, 17.7% once or twice per week and 80.8% never or only occasionally. Soft drink consumption by adults in the last 12 months was 17.8%, 45.3% once or twice per week and 36.9% never or only occasionally.

5-2-5-2 Current conditions in adults of 13-14

The education level for these adults was 7.9% primary school education completed, 41.3% for secondary school completion and 50.8% university completion. The consumption of meat in the last 12 months was 20.3% most or all days, 69.5% once or twice per week and 10.2% never or only occasionally. Seafood consumption was 28.6% most or all days, 46.4% once or twice per week and 25.0% never or only occasionally. The consumption of fruits was 48.3% most or all days, 44.8% once or twice per week and 6.9% never or only occasionally. The consumption of cereal was 36.2% most or all days, 21.7% once or twice per week and 8.3% never or only occasionally.

5-2-5-3 Active smoking in adults

5-2-5-3-1 Active smoking in adults of children 6-7 years

The prevalence of tobacco smoking increased in adults. 2.4% of adults ever smoked daily, 5.4% smoked less than daily, and 92.1% never smoked at all. Current adult tobacco smokers were 1.2% daily smokers, 2.9% less than daily. The mean age adults started smoking was 20.33, the mean smoking per day was 4.18 and 0.8% smoked shisha or water pipe at home.

5-2-5-3-2 Active smoking in adults of adolescents 13-14 years

The prevalence of tobacco use was 1.6% for daily smoking, 6.3% smoked less than daily. 3.3% were currently smoking tobacco less than daily. The mean age started smoking tobacco was 23.75, mean number of cigarettes smoked per day are 3.5 and 1.7% smoked water pipe or shisha at home.

5-2-5-4 Indoor environment of adults

5-2-5-4-1 Indoor environment of adults of 6-7 years children

The exposure of adults to damp in the home was 36.5% damp in the home now, 18.8% damp in the home during pregnancy, 18.7% during the first year in home and 27.4% at some other time. The presence of mould in homes of adults was significant, with 29.1% having mould in home now, 16.1% having mould in the home during pregnancy, 14.1% had mould in the living room, 14.1% having mould in the home during the first year, and 21.0% had mould in the home at some other time.

The use of different types of fuels in adults homes with 1.3% of adults not cooking at home, 7.1% cooking fuel being electricity, 28.2% using Liquefied petroleum gas, 55.6% used natural gas, 4.5% used biogas, 7.4% used kerosene for cooking, 6.6% used coal/lignite, 34.0% used charcoal, 40.2% used wood, 1.0% used grass, 0.1% used animal dung and 1.3% used agricultural crop residue. There are diverse types of stove used by adults in homes. 24.2% use open fire for cooking, 7.5% use surrounded fire, 8.4% use surrounded fire with sunken pot, 8.4% use stove with combustion chamber, 8.4% used two or three pot stove, 8.4% use griddle stove, and 8.4% use sunken pot stove.

5-2-6- Asthma management in adults

5-2-6-1- Asthma management now in adults of 6-7 years children

The prevalence of asthma was higher in adults than children but lower than in adolescents. There were 3.4% of adults who ever had asthma, 11.8% asthma was confirmed by a doctor, and 8.8% had a written plan. The mean age they had first asthma attack was 13.9. The asthma attacks in the last 12 months was 3.8%. The use of inhaled medicines in the last 12 months was by 8.3%. The frequency of SABA use in the last 12 months was 14.3% used every day, 8.6% used in short courses and 77.1% only used when needed. The use of LABA in the last 12 months was 25.0% use every day, 25.0% in short courses and 50.0% only when needed.

5-2-6-2- Asthma management now in adults of adolescents 13-14 years

There were 1.5% who had asthma and 6.3% asthma was confirmed by a doctor, 5.9% had a written asthma plan. The mean age they had had asthma was 25 and SABA use was 100.0% only when needed in the last 12 months and LABA use was 66.7% only when needed and 33.3% in short courses, and the use of swallowed medicines was 5.9%.

5-2-6-3- Work absence by adults of children and adolescents

There are adults of children who had wheezing due to job type, 5.1% occupied jobs that cause wheezing, and 8.1% left a job because of breathing problems. There were 8.1% of adults of adolescents whose job caused wheezing or whistling and 9.1% left a job because

of their breathing problem.

5-2-6-4- School absence in adults of children and adolescents

There were 1.4% of adults in children who missed school in the last 12 months more than 12 times due to their asthma, 0.7% missed school between 4 to 12 times, 7.0% missed school 1 to 3 times, and 90.9% did not miss school. There were 23.8% of adults in adolescents that missed school in the last 12 months between 1 to 3 times.

5-2-6-5- Hospitalization in adults of children and adolescents

Urgent doctor visits were 1.1% more than 12 times in adults, 1.5% 4 to 12 times and 6.3% 1 to 3 times. There were 1.1% of adults in children who had urgent emergency department visits in the last 12 months between 4 to 12 times and 2.2% between 1 to 3 times. Meanwhile there were 1.4% of adults that visited the hospital more than 2 times in the last 12 months, 2.5% visited the hospital 2 times and 3.2% visited the once. There were 21.1% of urgent doctor visit in the last 12 months between 1 to 3 times in adults of adolescents. Also 5.0% of urgent emergency department visits in the last 12 months between 1 to 3 times. Meanwhile there were 4.8% of hospitalizations more than 2 times, 9.5% two times and 9.5% had one hospital visit.

5-2-7 Prevalence of asthma and management among children by sex in

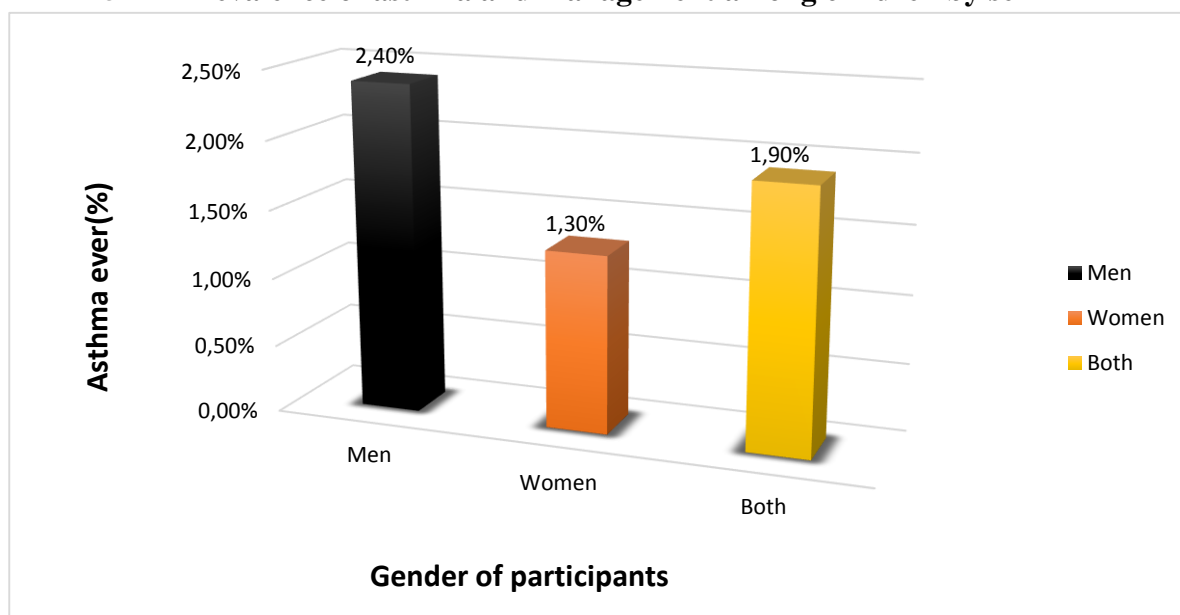


Figure 10:

The prevalence of asthma ever percentage in children 6-7 years by gender.

In males of children, asthma prevalence is higher than in the general population with 8 out of 330 male asthmatics being 2.4 percent affected (see Figure 10) and a 95% CI (1.23-4.71). With a total prevalence of 1.9 percent in all 722 children with a 95% CI (1.06-3.06), we noticed a significant decrease in the number of female children affected with only 5 out of 13 asthmatic female children being 1.3 percent and 95% CI (0.55-2.95)

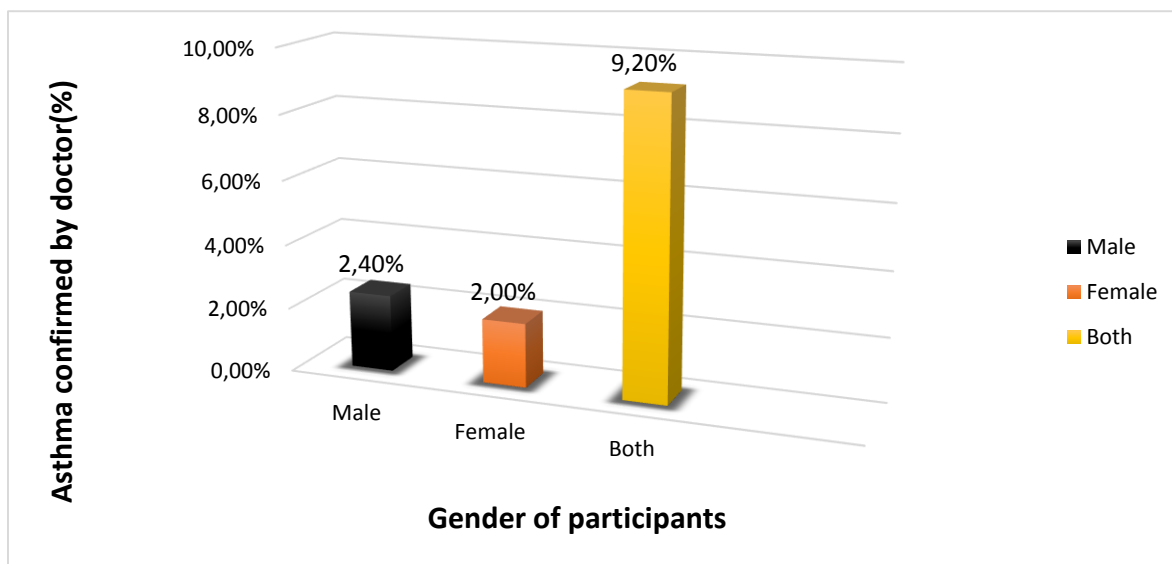


Figure 11:
The prevalence of asthma percentage confirmed by doctor in children 6-7 years by gender.

The diagnosis of asthma by doctors is same as self-reported prevalence. With 2.4 percent of male children being 8 out of 330 and a 95% CI (1.23-4.71). The prevalence in female children was 2.0 (see Figure 11) percent same as in males with 8 out of 16 and 95% CI (1.04-3.98). The prevalence of doctor reported asthma in children was higher than in both genders with 16 out of 722 children and higher than self-reported asthma by 9.2 percent and

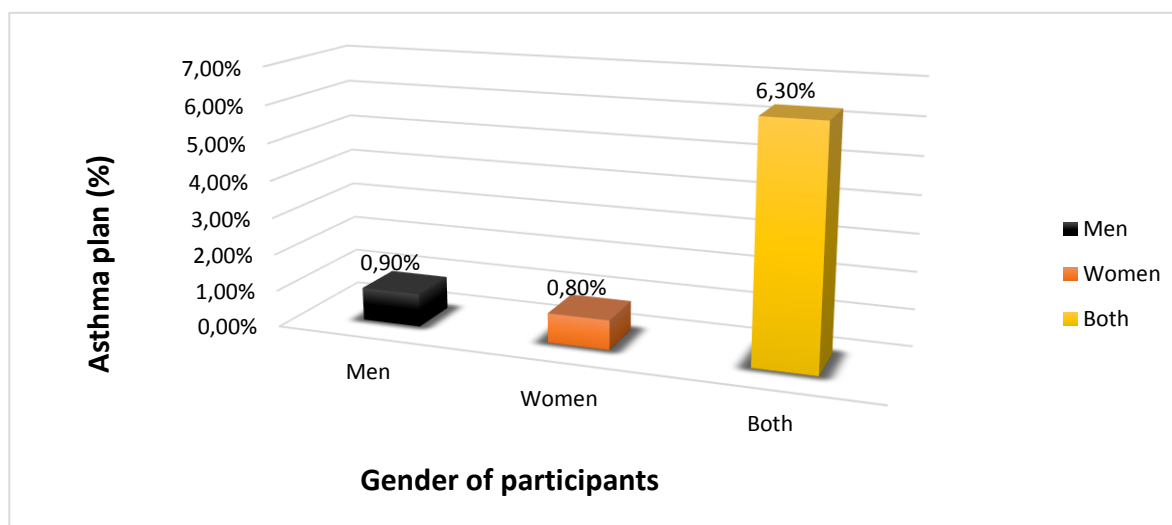


Figure 12:
The presence of asthma management plan percentage in children 6-7 years by gender

The use of an asthma plan in children was drastically low in both genders with only 0.9 percent being 7 out of 330 children have a plan for asthma management with a 95% CI (1.03-4.31) (see Figure 12). This management problem is worse in female children with only 3 out of 392 children having an asthma management plan of 0.8 percent with 95% CI (0.26-2.23). The management of asthma in both genders is higher than in the female and

male with 6.3 percent being 10 out of 722 children and 95% CI (0.75-2.53).

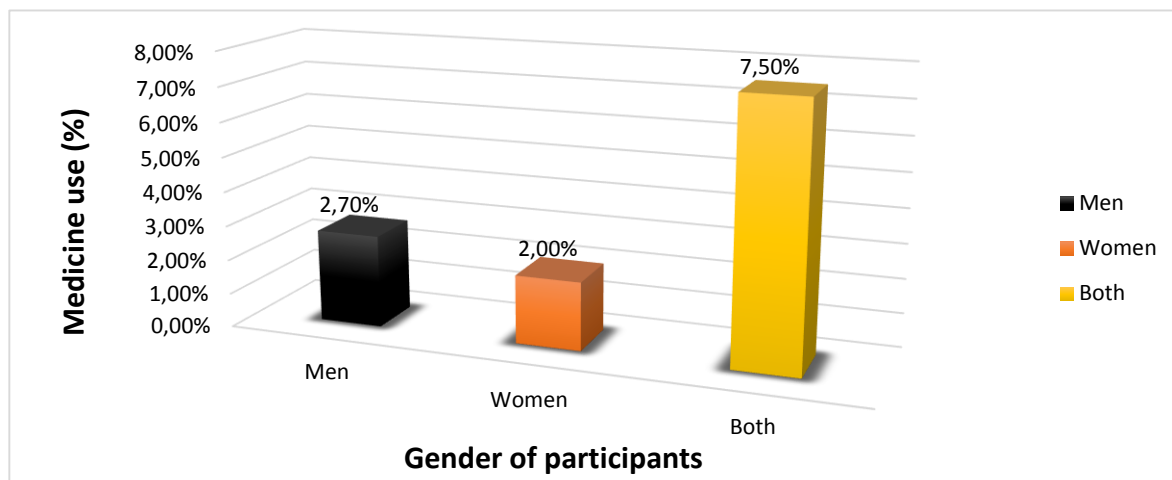


Figure 13:
The prevalence of asthma medicine percentage use in children 6-7 years by gender

The use of medicines in asthmatic children was also disproportionate lower, with only 2.7 percent being 9 out of 330 children using medicines among those affected with a 95% CI (1.44-5.10) (see Figure 13), in the females the use of medicines slightly lower and being 2.0 percent with 95% CI (1.04-3.98). The use of medicines in both genders being only 7.5% or 17 out of 722 children with a 95% CI (1.47-3.74).

5-2-8- Prevalence of asthma and management among adolescents by sex in Yaounde.

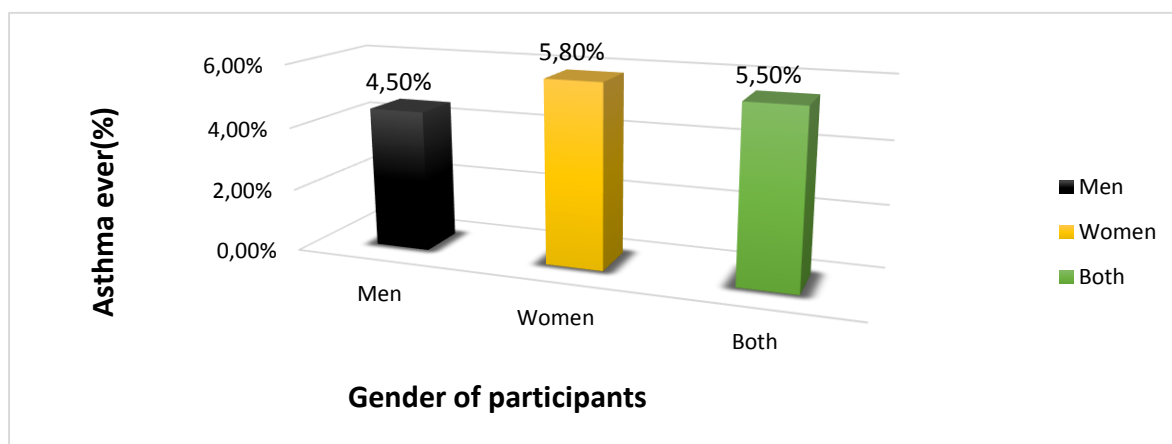


Figure 14:
The prevalence of asthma ever percentage in adolescents 13-14 year's by gender.

The prevalence of asthma ever was significantly high in the females with 36 out of 620 being affected, representing 5.8 percent and a 95% CI (4.22-7.93) (see Figure 14). The prevalence in both males and females was 56 out of 1066 affected with asthma, representing 5.5 percent of the total population and a 95% CI (4.07-6.76). The prevalence of asthma in

the males was lower, with 20 out of 445 affected, corresponding to 4.5 percent and a 95% CI ((2.92-6.83).

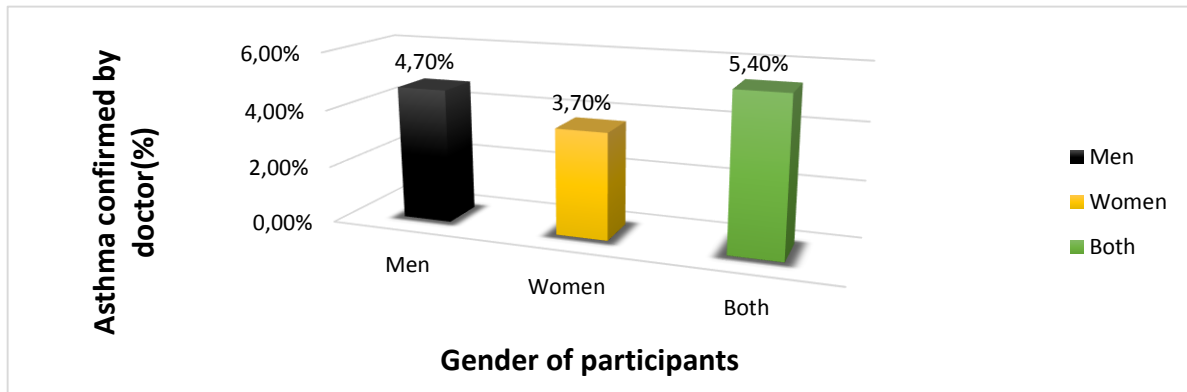


Figure 15:
The prevalence of asthma percentage confirmed by doctor in adolescents 13-14 year’s by gender.

The prevalence of asthma confirmed by a doctor was significantly lower in the females with 22 out of 620 being affected, representing 3.7 percent (see Figure 15), and a 95% CI (2.36-5.31). There was an increase in doctor confirmed asthma among males with 21 out of 446 affected, representing 4.7 percent and a 95% CI (3.10-7.09). The prevalence in both was slightly lower than that in asthma ever, with 43 out of 1066 affected corresponding to 5.4 percent and a 95% CI (3.01-5.39).

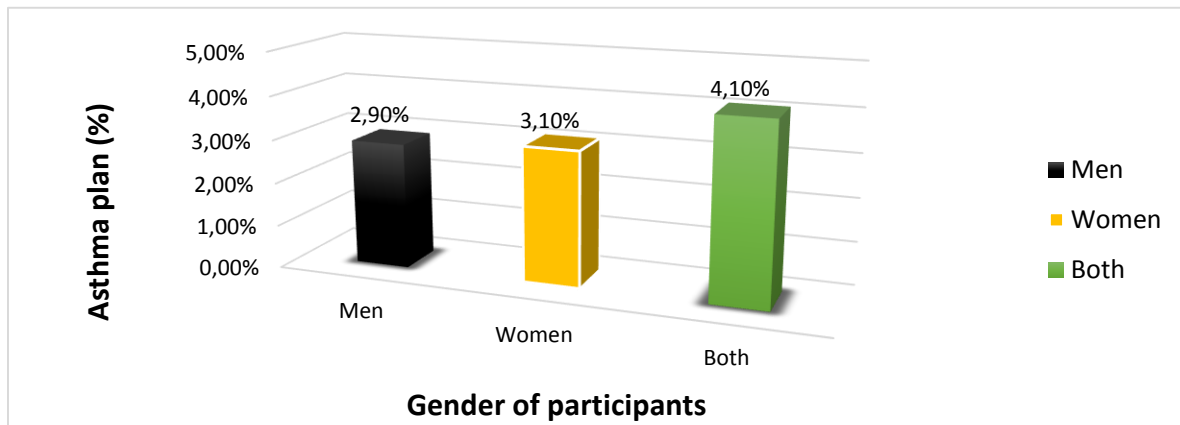


Figure 16:
The prevalence of asthma plan percentage in adolescents 13-14 year’s by gender.

The prevalence in adolescents with asthma plan was higher in females as we observed 19 out of 620 representing 3.1 and a 95% CI (1.97-4.74). There was a decrease in males with 13 out of 446 adolescents representing 2.9 (see Figure 16) percent and a 95% CI (1.71-4.92). The prevalence in males and females was 32 out of 1066 representing 4.1 percent and 95% CI (2.13-4.21).

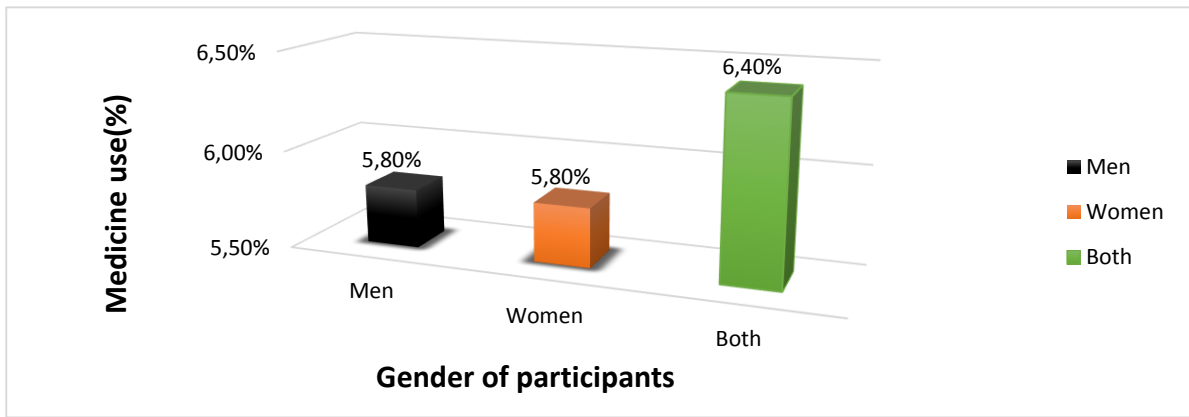


Figure 17:
The prevalence of medicines inhaled percentage in adolescents 13-14 year's by gender.

The prevalence of medicines inhaled in adolescents was significantly higher compared to those with confirmed asthma with 62 out of 1066 using medicines, representing 6.4 percent and a 95% CI (4.56-7.39). The prevalence of using medicines in males was same as in females, with 26 out of 446 males using medicines, representing 5.8 percent (see Figure 17) and a 95% CI (4.01-8.41). The prevalence of medicine use in females was 26 out of 620 representing 5.8 percent and 95% CI (4.22-7.93).

5-2-9 Prevalence of asthma and management among adults by sex in Yaounde.

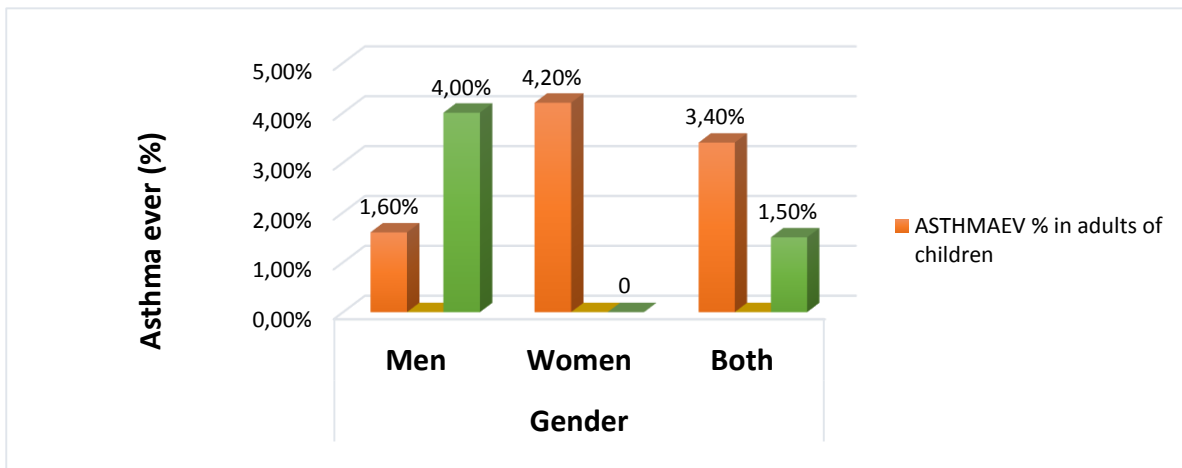


Figure 18:
The prevalence of asthma ever percentage in adults of children 6-7 years and adolescents 13-14 year's by gender.

The prevalence of asthma ever in female adults of children 6-7 years was significantly high with 20 out of 473 representing 4.2 percent (see Figure 18), and 95% CI (2.75-6.44). There was a sharp decrease in males of this age group with 5 out of 320 affected representing 1.6 percent and a 95% CI (0.67-3.61). The prevalence in both genders being less than in women with 25 out of 793 affected, representing 3.4 percent and a 95% CI (2.14-4.61). There was a significant increase in males 4.0 percent and 95% CI (0.71-19.54) with females having no information in adults of adolescents respectively due to a small sample size.

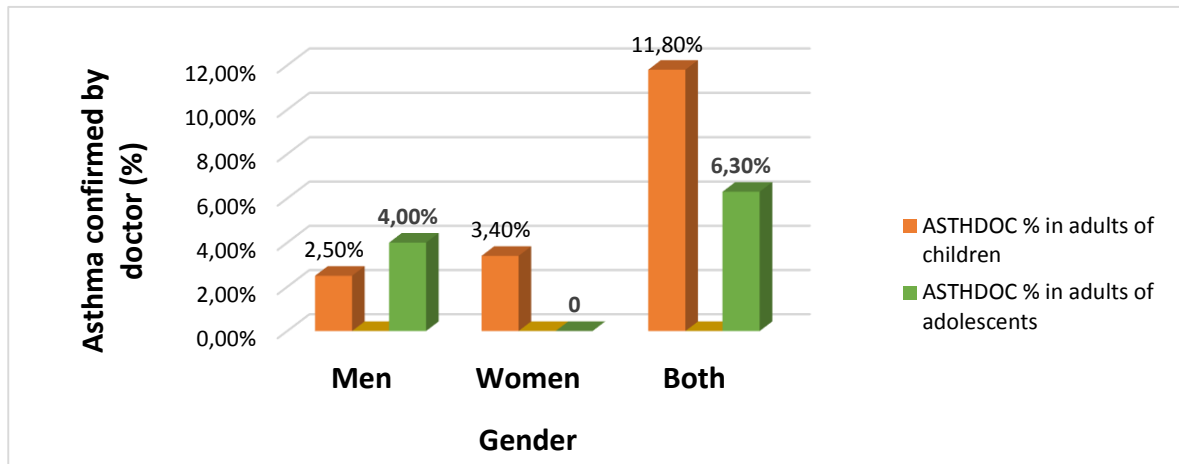


Figure 19:
The prevalence of asthma percentage confirmed by doctor in adults of children 6-7 years and adolescents 13-14 year's by gender.

The prevalence of asthma confirmed by a doctor in female adults of children 6-7 years was significantly high with 16 out of 473 representing 3.4 percent and 95% CI (2.10-5.42). There was a sharp decrease in males of this age group with 8 out of 320 affected representing 2.5 percent (see Figure 19), and a 95% CI (1.27-4.86).

The prevalence in both genders being higher than in female and males with 24 out of 793 affected, representing 11.8 percent and a 95% CI (2.04-4.46). There was a significant increase in males 4.0 percent and 95% CI (0.71-19.54) with 1 out of 67 in all adults of adolescents 6.3 percent and CI (0.26-7.98) due to a small sample size.

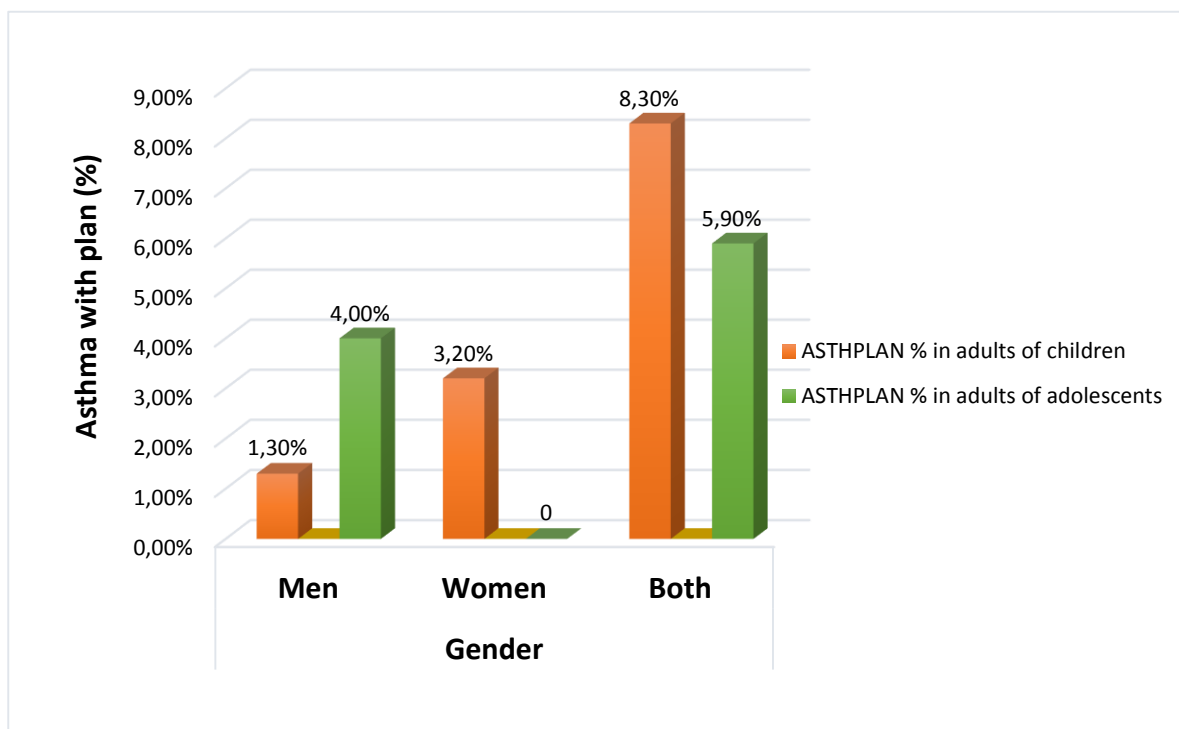


Figure 20:
The presence of asthma patients with a management plan percentage in adults of children 6-7 years and adolescents 13-14 year's by gender.

The presence of asthma patients with a management plan in female adults of children 6-7 years was significantly high with 15 out of 473 representing 3.2 percent and 95% CI (1.93-5.17). This availability of asthma patients with a plan decreased in in males with 4 out of 320(see Figure 20), having an asthma plan representing 1.3% and a 95% CI (0.49-3.17). The total number of adults with an asthma plan were 19 out of 793 representing 8.8 percent and a 95% CI (1.54-3.71). In the adults of adolescents, the presence of asthma plan was low with 1 male out of 25 having a plan representing 4.0 percent and a 95% CI (0.71-19.54). This increase in availability is mainly due to the sample size.

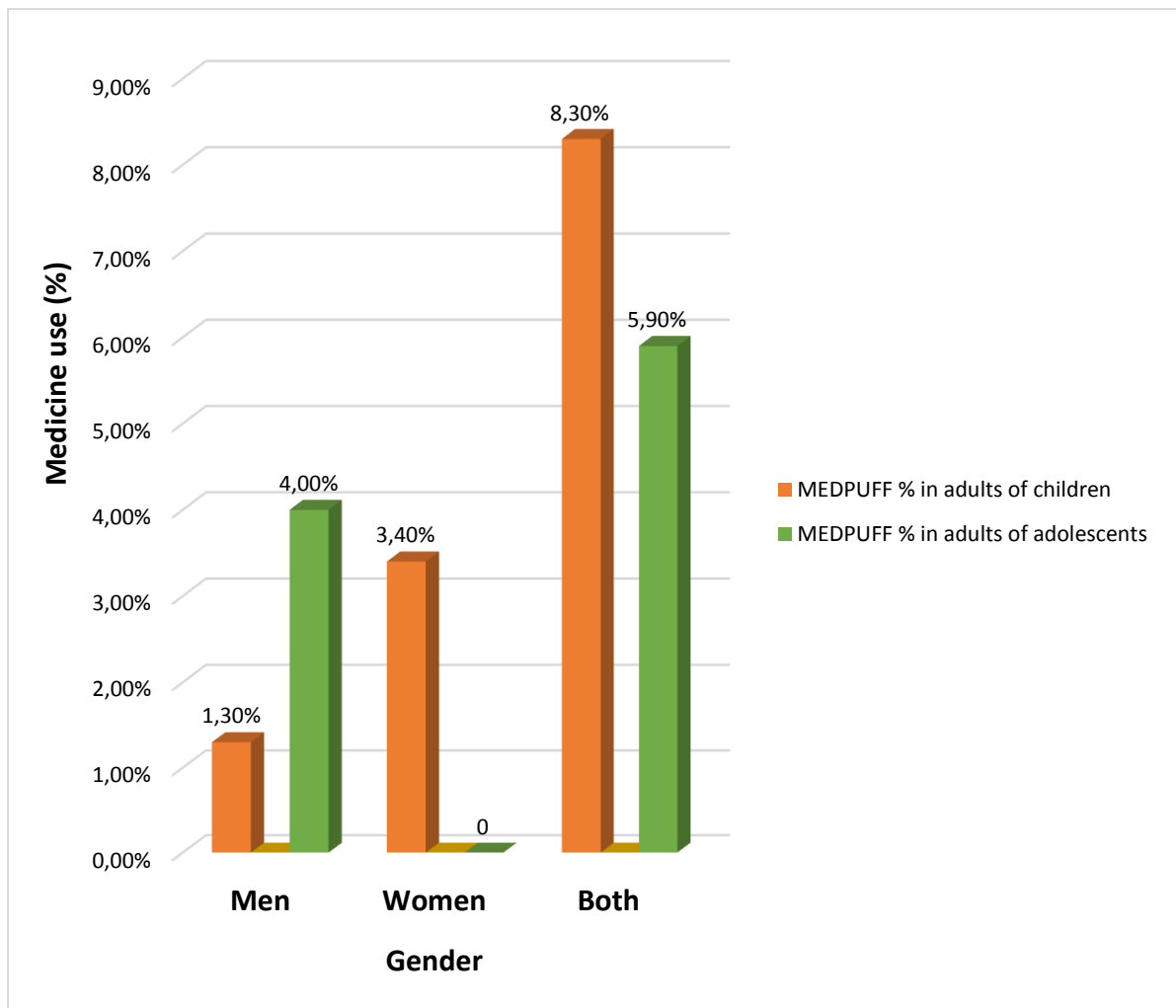


Figure 21:
The prevalence of medicine use percentage in adults of children 6-7 years and adolescents 13-14 year's by gender.

The prevalence of medicine use was significantly high in female adults of children 6-7 years with 16 out of 473 representing 3.4 percent and 95% CI (2.09-5.42). This prevalence of medicine use decreased in in males with 4 out of 320(see Figure 21), having an asthma plan representing 1.3% and a 95% CI (0.49-3.17). The total number of adults using medicine was 20 out of 793 representing 8.3 percent and a 95% CI (1.64-3.86).

CHAPTER 6: DISCUSSION AND INTERPRATATION

Given that asthma is one of the Holy Seven Psychosomatic Diseases, the field of psychosomatic medicine since Alexander and French revelation has come a long way. Asthma being a psychosomatic disease in which psychological determinants identified implied that it could be treated by psychotherapy. They suggested that environmental events serving to precipitate disease revokes latent unresolved conflicts derived from early infantile and childhood experience. The idea that the nature of the conflict has specificity for the specific disease process is more difficult to substantiate. Also, the vulnerable organ will survive largely because of its adaptiveness to several interpretations. This is to say an organ sensitized by an early psychosexual trauma, a developmental conditioning explanation (Chase, 1979).

The prevalence and severity of self-reported asthma in relation to psychosocial, biological and socio-economic risk factors was the turning point of this study. Our interpretation and discussion will consider different aspects of our study which were: theoretical, environmental, medical and nutritive in relations to tobacco use, body mass index, diet, breast feeding, birth weight, paracetamol use, antibiotics use, truck traffic, farm animals, cats and dogs, air pollution, cooking fuels, migration and siblings.

6-1- Discussion and interpretation of hypothesis 1 (Specific objective 1)

Our first research hypothesis stipulates that there is a correlation between psychosocial risk factors and asthma episodes. It is expected that tobacco use, emotions, depression and stress will worsen quality of life in asthmatic patients. While exploiting the Freudian theory, the notion of psychic trauma, observing hysterical patients who have developed symptoms as a result of trauma, finds a dissociation between the representation of the trauma and the affect (the emotional charge) associated with this representation. In other words, what the subject represses is in the order of anxiety. The benefit of the conversion symptom would be to spare the subject the suffering of anguish. But let us note that the memory would be to spare the subject the suffering of anguish. Also, Freud used the term conversion for the first time. It reads: In hysteria, the act of rendering the irreconcilable representation harmless occurs because its amount of excitement is transposed into the bodily, which is why I would like to suggest the name conversion. Asthma has a particular specificity, because the disease is not visible, only the presence of symptoms is visible (Lamouroux, 2012).

This leap of the psyche into somatic innervation will remain an enigma. Freud, however, will put forward a hypothesis of a neurological order to explain the ways in which this leap of the psyche into the somatic takes place: "the conversion occurs by following a motor or sensory innervation which is in an intimate correlation or more relaxed with the traumatic lived experience (Stéphanie, 2009).

The association between tobacco use and asthma according to Freud, the notion of psychic trauma by observing hysterical patients who have developed symptoms as a result of trauma, finds a dissociation between the representation of the trauma and the affect (the emotional charge) associated with this representation. In other words, what the subject represses is in the order of anxiety. The benefit of the conversion symptom would be to spare the subject the suffering of anguish. But let us note that the memory would be to spare the subject the suffering of anguish. The nevropsychoses of defense explained by Freud in 1894 says he used the term conversion for the first time. It reads: "In hysteria, the act of rendering the irreconcilable representation harmless occurs because its amount of excitement is transposed into the bodily, which is why I would like to suggest the name conversion.

Asthma that is difficult to control greatly affects the quality of life on several levels depending on the degree of severity of the pathology. In our study, the prevalence of shisha or water pipe smoked at home doubled in adolescents with 5.0% currently smoking shisha or water pipe tobacco. This was a correlation highlight between poor quality of life and poor asthma control (Boussoffara *et al.*, 2017). It is the same for our study. Indeed, in the total population and in asthmatic patients who smoke, the worse the asthma control, the poorer the quality of life. Also, we find more asthma patients who have controlled asthma among those who have a good quality of life, than among those who have a poor quality of life, in the three samples. The definition of asthma control is enough to explain its relationship to poor quality of life.

It was hypothesized that the exposure to tobacco smoke in early life is associated with increased risk of symptoms of asthma. It was found that there is evidence that low birth weight is associated with maternal smoking in pregnancy. Also, child's low birth weight was associated to an increased risk of reported asthma ever and symptoms of asthma. Maternal and paternal smoking was associated with an increased risk of symptoms of asthma in both age groups, although the magnitude of the OR is higher for symptoms of asthma than the other outcomes. Maternal smoking is associated with higher ORs than paternal smoking. For asthma symptoms there is a clear dose relationship (1-4 cigarettes/day, OR 1.20). When maternal smoking in the child's first year of life and current maternal smoking are considered,

the main effect is due to maternal smoking in the child's first year of life. There was no interaction between maternal and paternal smoking. In our study it was revealed that exposure to tobacco smoke was a trigger for asthma attacks for asthmatics especially in children (Mitchell, 2014).

When maternal smoking in the child's first year of life and current maternal smoking are considered, the main effect is due to maternal smoking in the child's first year of life. There was no interaction between maternal and paternal smoking. In our study it was revealed that exposure to tobacco smoke was a trigger for asthma attacks for asthmatics especially in children. It is true smoking prevalence during pregnancy was small, there was still a risk from environmental tobacco smoke to cause asthma in children. The relationship between passive tobacco smoke and asthma in children has been well established by studying the levels of serum cotinine and the prevalence of asthma. High exposure risk of asthma in children. It was found that there is evidence that low birth weight is associated with maternal smoking in pregnancy. Also, child's low birth weight was associated to an increased risk of reported asthma ever and symptoms of asthma (Mitchell, 2014). Exposure to tobacco smoke in early life is associated with increased risk of symptoms of asthma.

This exposure to tobacco smoke is a trigger for asthma attacks for asthmatics (Jarvis, 1999). Though maternal smoking during pregnancy was low in our study with only 04% of children with mothers smoking. On the contrary there was an increase in the prevalence of parents of children with 2.4% ever smoked daily with 1.2% currently smoking daily. Thus, exposure to environmental smoking will be associated to male parent smoking. There was an association between water pipe smoking with increased risk of symptoms of asthma. From a related study in Syria with respiratory effects in children from passive smoke of cigarettes and narghile (Mohammad *et al.*, 2014). In our study only 0.6% of parents smoked water pipe meanwhile there was significant increase in adolescents 4.8% which is associated to the high prevalence of asthma among adolescents (Table VIII).

Emotions and asthma according to Alexandra proves that anger, guilt, aggression are expressions that are often repressed and produce a tension conducive to disorganization of the visceral organs. Disorders of the respiratory system such as bronchial asthma. Negative emotions in asthma patients are also related to disease control. There is a strong negative correlation between asthma control and negative emotions: the more people have negative emotions, the less well their asthma is controlled. Failure to successfully treat your asthma can indeed lead to discouragement, the rumination of negative emotions and, as noted above, depression as well.) It was reported that asthma as a psychosomatic illness elicits emotional

responses (El Ismaili *et al.*, 2008). They add that mainly depression and anxiety as well are factors that have a negative influence on asthma control. It appears from the study that they carried out on 80 asthma patients, that depression is common in asthma patients with around 30% of patients affected. Our study goes in the same direction, we find that negative emotions are strongly correlated with anxiety and depressive states: the more asthma patients have an intense anxious or depressive state, the more they feel negative emotions. In a way, as in the other, this relationship of depression, anxiety and negative emotions is quite easily understood. The more negative emotions are present in patients, the more the anxiety-depressive state becomes more intense (Table VIII).

Depression and asthma looking at the Sami-Ali psychosomatic theory, relational psychosomatics refers to a new epistemology, as well as to a method aimed at understanding and helping human beings in a particular situation, that of illness (Sami-Ali, 2013). This theory differs from the psychosomatic approach presented earlier by the fact that Sami-Ali, who is at the origin of it, conceives of the human being as "a unity transcending the distinction of soul and body". This unity of which the author speaks refers to two types of causality which are opposed and yet include each other: linear causality and circular causality. Linear causality underlies the psychic / somatic relationship, which in a circular motion moves closer or further away from each other (Stéphanie, 2009).

On a practical level, the relation indicates the link between two variables which are the psychic functioning and the situation in which the person is engaged. Psychic functioning is defined in relation to dream activity declined in 4 forms: absent or present dreams, present then absent, absent then present, to which is added a fifth form, which is the instability of functioning. The situation corresponds to the pathology and refers to a soluble or insoluble conflict. If it is soluble it is the starting point for functional pathologies, if it is insoluble it refers to the relational impasse. Relationship impasse is a concept proposed and studied by Sami-Ali according to which the person experiences a conflict without outcome and where each time one believes to find a solution, it is illusory (Sami-Ali, 2013). According to this approach, asthma appears to occur in a context of soluble conflict, that is, the solution occurs through symptomatic formation. Breathlessness then becomes a sign of a conflict that needs to be resolved. Relational psychosomatics then proposes to set up a relational dynamic in which conflicts can be updated and integrated.

Depression and anxiety are also linked to a poor quality of life in patients with asthma. There is a strong correlation between the intensity of the depressive state and the quality of life in the three samples, thus the more the patients have an intense depressive state, the more

they have a poor quality of life. Another strong correlation is highlighted by this study in the sample of asthma smokers where the more the patients have an intense state of anxiety, the more they have a poor quality of life. (Li *et al.*,2015) obtain a lower quality of life score in asthma patients in the group of patients with anxiety and depression (Pefura-Yone *et al.*,2016) confirm this idea in a study they are conducting in Cameroon and explain that the systematic search for these psychiatric comorbidities could make it possible to optimize the management of asthma patients.

6-2- Discussion and Interpretation of hypothesis 2 (Specific objective 2)

It is expected that genetics and body mass index will be at the origin and worsen the quality of life of patients with asthma. Our second research hypothesis stipulates that there is a correlation between biological risk factors and asthma episodes. It is expected that genetics and physiological conditions will be at the origin and worsen quality of life in asthmatic patients. We will lean on Marty's psychosomatic theory which suggests that a malfunction of the preconscious is thus a prelude to the appearance of psychosomatic disorders. The process of somatization by regression which results in reversible pathologies benign with crisis such as asthma attack.

According to the Marty theory, contrary to Alexander's theories, the Paris school does not retain this notion of psychosomatic "specificity" at the level where the American school envisioned it. Attached to founding a discipline which would finally find its "own nosographic criteria", Marty indeed gives up considering the somatic dimension of the disease as a significant datum: "A determined somatic disease, responding to classical medical nosography (bronchial asthma, for example). Can occur in different economic conditions from one individual to another, sometimes also different in the same subject depending on the time. Knowledge of the structure of a subject as well as the appreciation of current variations in this structure, are necessary at all times to establish a diagnosis, to estimate a prognosis, to decide on a treatment ". What Marty means here by "structure" naturally refers to the way in which character neuvroses are structured, conducive to the disorganization that he himself described; it is indeed at the psychic level that the leader of the first "French institute of psychosomatics" considers the specific structural psychosomatic (Stéphanie, 2009).

Genetics and asthma explained by Pierre Marty proposing an approach to the processes of somatization in which he expresses that psychosomatic science, whose breadth is due to the fact that it contains psychoanalysis from which it is moreover the result, also encompasses knowledge of medicine, physiology, biology. According to this author, the

process of somatization consists of the discharge of excitation - normal to human functioning - which fails to develop mentally or to take the path of behavior, uses the somatic path and "sooner or later reaches the apparatus. Somatic and neuronal pathological (Stora, 2006) sums up Marty's approach by presenting regression somatization, which corresponds to previous functional fixations and manifests as "seizure" diseases such as asthma.

There was a strong association of wheezing symptom and risk factor for asthma in children, adolescents and adults in Yaounde. The prevalence of asthma was not evenly distributed among different age groups. The prevalence was higher in adolescents than in children and adults (Table VIII). At the level of socio-demographic characteristics, we can observe a certain inequality at the level of the sexes. In fact, among the 95 patients in our study, 36% are men and 64% are women. Several studies show that asthma is more common in women. In the study by (Moukram *et al.*, 2017) women represented 57% of all asthma patients consulting in the respiratory diseases department in Casablanca. Also, in a related study, women represented 72% of the asthmatic population surveyed. An explanatory hypothesis is that asthma in women has specificities modulated by hormonal life (Jridi *et al.*, 2015).

The literature reminds us that while the risks associated with asthma may vary according to age, this disease affects all generations, from infants to the elderly (Dutau *et al.*, 2017). Few of the studies link age with worsening, severity or non-control of asthma. In our study, age emerged as an aggravating factor or having an impact on the respiratory pathology; either being a man or a woman. The prevalence was higher among adolescents than in children and adult age group (Table VIII). In childhood, male sex is a risk factor for asthma. In our study, sex was associated to asthma, among males being 2.4% and 1.3% in females of children, in adolescents there was a reverse severity in females 5.8% and males 4.5% of adolescents, asthma was even more severe in females of adults with 4.2% and 1.6% in males. In our study we identified different host factors responsible for asthma risk factors in children, adolescents and adults. The genetic host factor.

There are wide variations in prevalence of wheeze around the world. The prevalence of wheeze in the past 12 months in adolescents varied from 32.6% in Wellington (New Zealand) to 0.8% in Tibet (China), and in children from 37.6% in Costa Rica to 2.4% in Jodhpur (India).(Ellwood, 2015). The prevalence of wheeze in the past 12 months among adolescents in our study was 15.9% and decreased significantly among children (Table VIII). Also, the prevalence of symptoms of severe asthma (defined as ≥ 4 attacks of wheeze, or ≥ 1 night per week sleep disturbance from wheeze, or wheeze affecting speech in the past 12

months) varied from 5.0% in children to 5.8% in adolescents and 6.2% in adults with wheeze attacks greater than 4 episodes, ≥ 1 night per week sleep disturbance from wheeze in children was 6.7%, 6.9% in adolescents and 5.2% in adults and wheeze affecting speech in 9.0% children, 12.4% adolescents and 9.3% adults. Our study revealed a significant variation trend towards a higher prevalence of current wheeze in adolescents, then to children and in adults, but this trend was reversed for the prevalence of severe symptoms among current wheezers, especially in the adults.

Possible risk factors identified for trouble with wheezing ever or current and wheezing attacks in last 12 months were the presence of other allergic diseases (hay fever and eczema), early infections, smoking at home, and paracetamol use. These patterns have been described previously by World Allergy Organization. For example, the evolution of allergic sensitization followed by atopic dermatitis, allergic rhinitis, and asthma have been demonstrated in several epidemiological studies. A possible explanation for the association of atopic dermatitis, allergic rhinitis, and asthma could be the filaggrin loss-of-function mutations. Filaggrin is a skin epidermal protein that contributes to the natural skin barrier protecting against transcutaneous water loss, as well as preventing the entry of environmental allergens through the skin. Filaggrin loss-of-function mutations provoke epidermal barrier dysfunction, increasing the risk of eczema. These mutations are also associated with allergic sensitization and airway allergy, expressed as allergic rhinitis and asthma later in childhood (Del-Rio-Navarro *et al.*, 2020).

There is a close association between body mass index and asthma. It was hypothesized that the excessive weight of children and adolescents in comparison with their height, is associated with an increased risk of symptoms of asthma. An association was reported between obesity and symptoms of asthma and clear evidence of a dose-effect relationship with the magnitude of the risk of symptoms of asthma and eczema greater with obesity than with overweight (Mitchell *et al.*, 2014). In our study, the mean height in adolescents was 1.57m and mean weight was 50.2kg. In children the mean height was 1.19 and mean weight was 23.96kg. Vigorous physical activity was positively associate with 14.3[95% CI 11.24 – 15.29] written and (OR 32.6[95% CI 18.76 – 23.67]) video but not children. Viewing television for five or more hours/day was associated with an increased risk of symptoms of asthma in adolescents with (OR 33.1[95% CI 28.44 – 33.99]) and (OR 12.4[95% CI 8.53– 12.98]) symptoms of asthma in children. In our study there was a relationship between body mass index and risk of symptoms of asthma especially with significant number of overweight children and adolescents.

The association between plant-based diet protecting against asthma and allergies. There was a negative association between the intake of fast food and asthma symptoms and a positive association between the intake of fresh fruit and vegetables (Ellwood et al., 2013). These associations were also found by (Nagel et al., 2010) and (Wickens et al., 2005) Three diet analysis in our study revealed that for adolescents and children, there was a potential protective effect on severe asthma was associated with consumption of fruit ≥ 3 times per week (OR 41.5[95% CI 34.21– 40.95]; OR 38.8[95% CI 23.24– 29.65], respectively).(Table XI and X). Also, an increased risk of severe asthma in adolescents and children was associated with the consumption of fast food ≥ 3 times per week (OR 8.5[95% CI 5.23– 48.22]; OR 3.1[95% CI 0.56– 2.17], respectively). Similar patterns for both ages were observed for regional analyses, and were consistent with gender and affluence categories and with current symptoms of all three conditions. In our study diet ecological analysis included starch, cereals, rice, vegetables, fish, other seafood, fibre, fruit, nuts, olive oil(protective); trans fatty acids, fast foods(aggravating) (Table XI and X).

There is an association between low birth weight and increased risk of symptoms of asthma. Low birth weight (<2.5 kg) was associated with an increased risk of symptoms of asthma (current wheeze 51.1[95% CI 42.24 – 49.49]) (Mitchell et al., 2014). In our study there was a close association with mean weight of children being 3.5Kg confirming that low birth weight is a risk factor for symptoms of asthma.

The association between regular exercise and physical fitness being of protective against asthma. There was a positive association found between physical activity and symptoms of asthma in adolescents but not in children and an increased risk of asthma symptoms with television viewing for five or more hours/days in children and adolescents (Mitchell *et al.*, 2013). In our study there was a positive association between physical activity and symptoms of asthma in adolescents but not in children and an increased risk of asthma symptoms with television viewing for five or more hours/day in children and adolescents (Table X and XI).

An association was found between obesity and symptoms of asthma and clear evidence of a dose-effect relationship with the magnitude of the risk of symptoms of asthma greater with obesity than with overweight (Mitchell *et al.*, 2014). It is not known why asthma develops more frequently in the obese. Potential contributing factors include changes in airway function due to the effects of obesity on lung mechanics: the development of a pro-inflammatory state in obesity and an increased prevalence of comorbidities, genetic, developmental, hormonal or neurogenic influences. Obesity from our study had a strong

association with the prevalence of asthma. The prevalence and incidence of asthma are increased in obese subjects (body mass index $>30\text{kg/m}^2$), particularly in women with abdominal obesity this was $50.3\text{Kg}/1.6\text{m}^2$ in our study. This also supports the high prevalence of asthma among females of adolescents and adults. Inappropriate attribution of shortness of breath may contribute to over-diagnosis, but one study found that over-diagnosis of asthma was no more common in obese than in non-obese patients

6-3- Discussion and Interpretation of hypothesis 3(Specific objective 3)

Our third research hypothesis stipulates that there is a correlation between socio-economic risk factors and asthma episodes. It is expected that socio economic environment exposed to either urban or rural, exposed to pollutants, number of siblings will worsen the quality of life of patients. This hypothesis is directly linked to the Alexander's theories which proved that anger, guilt, aggression are expressions that are often repressed and produce a tension conducive to disorganization of the visceral organs. Disorders of the respiratory system such as bronchial asthma. The Alexander explanatory scheme is therefore the following: an individual psychodynamic adjustment would generate in certain circumstances the imbalance of a zone of congenital functional organic fragility, thus leading to the appearance of a disease (Stéphanie, 2009). Several studies suggest that the socio-professional and socioeconomic level can be taken into account in the risk of developing asthma.

Also, the Marty theory, contrary to Alexander's theories, the Paris school does not retain this notion of psychosomatic "specificity" at the level where the American school envisioned it. Attached to founding a discipline which would finally find its "own nosographic criteria", Marty indeed gives up considering the somatic dimension of the disease as a significant datum: "A determined somatic disease, responding to classical medical nosography (bronchial asthma, for example). Can occur in different economic conditions from one individual to another, sometimes also different in the same subject depending on the time. Knowledge of the structure of a subject as well as the appreciation of current variations in this structure, are necessary at all times to establish a diagnosis, to estimate a prognosis, to decide on a treatment ". What Marty means here by "structure" naturally refers to the way in which character neuroses are structured, conducive to the disorganization that he himself described; it is indeed at the psychic level that the leader of the first "French institute of psychosomatics" considers the specific structural psychosomatic. (Stéphanie, 2009).

Imposing itself with force in the mind of the person who "falls" ill, this idea has two sides: the effect of reality "caused" by psychic life contributes to the disease; on the other

hand, it can therefore contribute to healing. The psychosomatic "model" here implicitly finds the justification for the borrowing it makes, from the point of view of reasoning in any case, from the medical, or even biomedical, model. There is an explanation that the probability of developing asthma is favored by being unemployed, without a diploma, having low income. However, this study did not take this information into account (Riviere *et al.*, 2018). In our study this probability was very low, with 15.7% adults having primary, 40.9% secondary and 33.0% college, university and other tertiary education.

The ‘hygiene hypothesis,’ stipulates that that increased cleanliness, reduced family size, and subsequent decreased microbial exposure could explain the increases in asthma prevalence. This hypothesis suggests that the critical post-natal period of immune response is derailed by the extremely clean household environments often found in the developed world. In other words, the young child’s environment can be “too clean” to pose an effective challenge to a maturing immune system. According to the ‘hygiene hypothesis,’ is suppressed to prevent it from rejecting maternal tissue. Such a low default setting is necessary before birth. When the mother is providing the fetus with her own antibodies. But in the period immediately after birth the child’s own immune system must take over and learn how to fend for itself. Environmental exposures to proinflammatory microbial agents (such as bacterial endotoxin) have also been suggested to be protective. There is an increased association between socio-economic status (SES) and risk of asthma symptoms. Studies of the relationship between SES and health have shown that SES is multidimensional, incorporating elements of occupational characteristics, education, income, wealth and residential characteristics (Durkin *et al.*, 1994).

This hygiene hypothesis should be associated to the high prevalence of asthma among children and adolescents of rich families in Yaounde. In a study it was found that increasing number of siblings was associated to a decrease in the cumulative incidence and prevalence of cumulative incidence of asthma with increasing number of siblings. Although the hygiene hypothesis is generally explained as a protective effect of early exposures resulting in long-lasting health benefits, recent studies suggest that exposures throughout life may be important (and that long-term continual exposure may be required to maintain optimal protection)(Hesselmar *et al.*, 1999).

There is an association between paracetamol use and asthma. In the analysis of adolescents from 22 schools in Yaounde the current use of paracetamol was associated with an exposure-dependent increased risk of current asthma symptoms (OR 23.4[95% CI 20.11 – 25.12]).and (OR 60.0[95% CI 54.61 – 60.53]) for medium and high use vs no use,

respectively). This association was reported by (Newson *et al.*, 2000) that paracetamol consumption and prevalence of asthma symptoms in children. They speculate that paracetamol may influence atopic disease by depleting glutathione in the airways and in immune cells. Also, the study found that the use of paracetamol may represent an important risk factor for the development and or maintenance of asthma in adolescent children (Beasley *et al.*, 2008). With population attributable risks between 23.5% and 58%. There is a high association in our study between prenatal use of paracetamol and development of asthma among children in Yaounde (Table IX and X). This association was reported that paracetamol consumption and prevalence of asthma symptoms in children. They speculate that paracetamol may influence atopic disease by depleting glutathione in the airways and in immune cells. Also, this study found that the use of paracetamol may represent an important risk factor for the development and or maintenance of asthma in adolescent children. (Beasley *et al.*, 2008)

The use of antibiotic in the first year of life was associated with an increased risk of symptoms of asthma (Wickens *et al.*, 1999). The use of antibiotics was explored in Yaounde from 27 primary schools. It was demonstrated that there is an associated risk between symptoms of asthma and the use of antibiotics in early childhood with 51.2% used antibiotics. It was demonstrated that there is an associated risk between symptoms of asthma and the use of antibiotics in early childhood (Wickens *et al.*, 1999). An association was found between antibiotic use in the first year of life and current symptoms of asthma in children 6 and 7 years old (Beasley *et al.*, 2011).

Reported use of antibiotics in the first year of life was associated with an increased risk of current asthma symptoms (wheezing in the previous 12 months) with an OR adjusted for risk factors of 51.2[95% CI 40.51 – 57.76] when adjusted for other risk factors of asthma. Similar associations were observed for severe asthma symptoms (OR 9.0[95% CI 2.13 – 4.74]), and asthma ever (OR 1.9[95% CI 1.06 – 3.06]).(Table IX).

There was an association between truck traffic and respiratory irritants from truck traffic such as Sulphur dioxide (SO₂) nitrogen oxides (NO_x) and particulates from diesel combustion cause local respiratory inflammation. It was found that higher exposure to self-reported truck traffic on the street of residence is associated with increased reports of symptoms of asthma (Brunekreef *et al.*, 2009).

The frequency of truck traffic on the street of residence was positively associated with the prevalence of symptoms of asthma with an exposure- response relationship. ORs for “current wheeze” and almost the whole day” versus “never” truck traffic were 12.1[95% CI

9.51 – 13.31]) for adolescents and OR 14.4[95% CI 9.62 – 14.33] for children. These findings that higher exposure to self-reported truck traffic on the street of residence is associated with increased reports of symptoms of asthma in many locations in the world require further investigation in view of increasing exposure of the Yaoundes children to traffic (Table XI).

In our study, exposure to traffic pollution was associated to increasing tissue contact with inhaled allergens and the likelihood of an allergic responses. In previous ISAAC study involving 128 centres in 28 countries, asthma prevalence per 100 children per 10% increase in center-level PM_{2.5} and NO₂. There was an association between respiratory irritants such as Sulphur dioxide (SO₂), nitrogen oxides (NO_x) and particles from diesel combustion cause local respiratory inflammation, increasing tissue contact with inhaled allergens and the likelihood of an allergic response (Weiland *et al.*, 1994). The effects of ambient air pollution on human health are well documented. In our study there were no measurements for PM_{2.5} and NO₂ but given that in Yaounde more than 90% of children, adolescents and adults are exposed to air pollution levels far above WHO standards. The estimated average within country change in center-level asthma prevalence per 100 children per 10% increase in center level PM_{2.5} and NO₂. Short term exposure to pollutants can exacerbate underlying respiratory conditions e.g asthma (Samoli *et al.*, 2011), have a negative effect on lung function (Chen *et al.*, 2015), and cause excess hospital admissions for respiratory conditions (Atkinson *et al.*, 2014).

There was an association between the use of gas for cooking and increased risk of symptoms of asthma. In our study the use of open fire for cooking which was associated with an increased risk of symptoms of asthma and reported asthma in children for wheeze in the past year 14.0[95% CI 4.81– 8.39]; OR 20.2[95% CI 13.78– 18.15]. In the final multivariate analyses, OR 24.2[95% CI 7.95– 12.11] for children and OR 36.7[95% CI 9.42– 27.01] for adolescents. In both age groups, there was no evidence of an association between the use of gas as a cooking fuel and either asthma symptoms or asthma diagnosis. There is an increased bronchial responsiveness among persons with high total IGE levels who use gas for cooking suggesting that atopic subjects are sensitive to adverse effects of gas cooking on respiratory health (Kerkhof *et al.*, 1999). Worldwide, respiratory health effects account for nearly a half of the overall deaths and disabilities from household air pollution. Because a large number of families use open fires for cooking, this cooking method might be an important modifiable risk factor if the association is proven to be causal. The use of firewood for cooking was associated with the prevalence of asthma less in children but more in adolescents exposed to

smoke. In our study the use of gas for cooking was unlikely to be a major influence on respiratory morbidity in young adults.

However, (Moran *et al.*, 1999) concluded that the use of gas for cooking was unlikely to be a major influence on respiratory morbidity in young adults. It was found that the use of open fires for cooking is associated with an increased risk of symptoms of asthma in children (Wong *et al.*, 2013). This is because a large percentage of the world's population uses open fires for cooking, this method of cooking might be an important risk factor if the association is proven to be causal.

There was a revelation that migrants will adopt the prevalence of symptoms of asthma of their new country. The pre-migration environment might be protective, but this effect quickly decreases with increasing time in the host country. It was found that recent migration to high prevalence/affluent countries is associated with a lower prevalence of allergic diseases (García-Marcos *et al.*, 2014). In our study, it was found that immigration was associated with a lower symptom prevalence of asthma in both age groups than among those born in the country studied, and that this association was mainly confined to high prevalence countries. This reduced risk was greater in those who had lived fewer years in the host country. There were 5.3% of children that participated were not born in country of study, meanwhile 11.1% of adolescents were not born in country of study. In our study there was conflicting evidence in the literature regarding the health of immigrants.

Increased household size was associated with a decreased risk of symptoms of asthma. It has been found that increasing number of siblings was associated to a decrease in cumulative incidence of asthma with increasing number of siblings. In our study, data collected from 722 children in 27 primary schools and 1066 adolescents from 22 secondary schools revealed in both age groups inverse trends ($p < 0.01$) were observed for reported 'hay fever ever' with increasing numbers of total siblings, and more specifically older siblings (Hesselmar *et al.*, 1999).

Breast feeding in the first year of life is protective against the development of asthma. There was never a consistent association between breast feeding in the first year of life and either a history or current symptoms of wheezing in 6/7-year-old children, but a possible effect on severe symptoms of the latter two conditions (Bjorksten *et al.*, 2021). The introduction of other milk at less than 4 months of age was found by (Oddy *et al.*, 1999) to increase the risk of current wheeze 1.31 times (95% CI 1.05-1.64) when controlled for gestational age, sex, smoking in the household and childcare attendance in prospective birth cohort study of 2187 children in Western Australia. It was found that breast that breast

feeding for six or more months was associated with a decreased risk of transient early wheeze (OR 0.82 [95% CI 0.68 - 0.97]) (Rusconi *et al.*, 1999)

Exposure to farm animals is protective against the development of asthma in children. A positive association was found in our study between early exposure to farm animals and the prevalence of symptoms of asthma. It was found that a combination of prenatal and early life exposure was most strongly associated with wheeze, asthma medication, asthma ever (Douwes *et al.*, 2006). The ORs for 'current wheeze', farm animal exposure in the first year of life' and farm animal exposure in pregnancy were 11.4[95% CI 8.24 – 12.68] and 17.3[95% CI 13.18 – 18.48]), respectively. There is a strong association in our study between the combination of prenatal and current exposure to farm animals with wheeze, asthma medication, asthma ever, hay fever and eczema.

The exposure to animal allergens (cats and dogs) is associated with an increased risk of symptoms of asthma. In our study, among children, cat exposure in the first year of life was associated with current symptoms of asthma and wheeze especially being a less affluent country. Among adolescents, we found a positive association between exposure to cats or dogs and symptom prevalence with (OR 36.0[95% CI 32.55 – 38.28]) for cats and (OR 34.0[95% CI 30.63 – 36.28]) for dogs. With OR a covariate data (OR 5.5[95% CI 4.07 – 6.76]) for current asthma. (Roost *et al.*, 1999) found that current cat ownership represented a significant risk for sensitization to cat if cats were allowed indoors. They did, however suggest that childhood exposure to pets, including cats, might modulate immunologic mechanisms and reduce sensitization to cat in adulthood. It was found that children exposed to cat or dog during the first year of life was associated with a lower symptom prevalence of allergic rhinitis and asthma in school children (Hesslemer *et al.*, 1999). It is confirmed that early life exposure to cats is a risk factor for symptoms of asthma in 6- and 7-year-olds especially in less affluent countries (Brunekreef *et al.*, 2012)

The presence of carpets had an important association on early environmental exposure affecting the risk of subsequent development of asthma in children. There is an association between prenatal exposure to farm animals and prevalence of asthma symptoms. This association further supports the importance of early environment exposure affecting the risk of subsequent development of asthma. Carpets are large reservoirs for dust and associated microbial contaminants. In particular, exposure to dust and microbial agents would be considerably higher in homes with carpets versus those that only have smooth floor covering (Douwes *et al.*, 2006). In our study, carpets were confirmed to be large reservoirs for dust and associated microbial contaminants. Yaounde in particular experienced exposure to dust

and microbial agents would be considerably higher in homes with carpets versus those that only have smooth floor covering. There were 18.1% of children with mother's bedroom having a carpet, 40.7% children's living room having carpets and 10.9% of other rooms having carpets. The links between asthma and socioeconomic status, with a higher prevalence of asthma in developed than in developing nations; in poor compared with affluent populations in developed nations; and in affluent compared with poor populations in developing nations; are likely to reflect lifestyle differences such as exposure to allergens, infections, diet, and access to health care.

Occupational sensitizers from our study were also associated to asthma development. Though not very high, occupational asthma is asthma caused by exposure to an agent encountered in the work environment. Asthma is the most common occupational respiratory disorder in industrialized countries, and occupational agents are estimated to cause about 15% of cases of asthma among adults of working age. There are over 300 substances that have been associated with occupational asthma, including highly reactive small molecules such as isocyanates; irritants that may cause an alteration in airway responsiveness; immunogens such as platinum salts; and complex plant and animal biological products that stimulate the production of IgE (e.g. flour, laboratory rodents, wood dust).

The links between asthma and socioeconomic status, with a higher prevalence of asthma in developed than in developing nations; in poor compared with affluent populations in developed nations; and in affluent compared with poor populations in developing nations; are likely to reflect lifestyle differences such as exposure to allergens, infections, diet, and access to health care. Much of what is known about risk factors for the development of asthma comes from studies of young children; the risk factors in adults, particularly *de novo* in adults who did not have asthma in childhood, are less well defined. In our study, we noticed that the prevalence of asthma was higher among children from rich schools than the poor schools. This supports previous studies that asthma prevalence is higher in affluent compared with poor populations in developing nations.

The presence of moisture/mould in the home environment is associated with increased risk of asthma. In our study there was a consistent association of dampness with respiratory and other symptoms was found in both rich and poor homes, among both atopic and non-atopic children. There was a consistent association of dampness with respiratory and other symptoms was found in both affluent and non-affluent countries, among both atopic and non-atopic children (Weinmayr *et al.*, 2013).

CONCLUSION

Our intentions at the beginning of this study was to contribute in understanding breathing complications such as asthma in relation to environmental risk factors in Yaounde, Cameroon. The focus was to provide evidence from self-reported prevalence and severity of asthma among children, adolescents and adults. Asthma is such a rampant respiratory disease that needs urgent attention, awareness and advocacy. The data collected from children 6/7 years, adolescents 13/14 years and adults was related to environmental risk factors being; psycho-social, biological and socio-economic. While considering Freud's association of symptoms of disease to poor quality of life due to Depression, anxiety, alexithymia and negative emotions experiences by patients, the more severe their asthma. Considering our specific objectives being set at the beginning of our study;

To identify the symptoms of asthma episodes in Yaounde. The symptoms of breathing complications among children, adolescents and adults. These symptoms vary among the different age groups. We identified the following symptoms; trouble with wheezing ever or current being higher among adolescents than in adults and smallest in children. Wheezing attacks in the last 12 months was still higher in adolescents, in this case higher among children than in adults. There was still a significant increase in the prevalence of sleep disturbed in the last 12 months, with adolescents being waking more at night than children, then adults. Breathless when wheezing noise was present was found only in adults but not among children and adolescents. Sleep disturbed due to shortness of breath in the last 12 months was only among adults. Severe wheeze in the last 12 months was still very high among adolescents than in adults and in children respectively. The prevalence of self-reported asthma at 3.6% (n=2648) respondents, with 1.8%, 5.3% and 3.0% in children, adolescents and adults, respectively. Genetic conditions as well as body mass index will worsen asthma control and lead to poor quality of life among children, adolescents and adults. Considering Marty's theory on the malfunction of the preconscious being a condition ahead of the appearance of psychosomatic disorders. The process of somatization by regression which results in reversible pathologies begin with crisis of asthma attack.

To determining the environmental risk factors associated to asthma episodes in Yaounde. There were numerous risk factors ranging from psycho-social, biological and socio-economic identified that were associated to the high prevalence of asthma in Yaounde. There were prenatal environmental conditions of children that will favor asthma episodes at birth such as paracetamol use during pregnancy, exposure to farm animals during pregnancy, exposure to carpets, as well secondhand smoke exposure during pregnancy. These prenatal

conditions will favor asthma development after birth in children, including postnatal conditions such as breastfeeding, drunk milk, paracetamol use, chest infection, antibiotic use, visiting home care, physical activity, watching television, computer use and prevalence of pneumonia. Other indoor conditions that made children at risk of developing asthma included; cats in home, dog in home, paracetamol, meat consumption, seafood consumption, fruit consumption, cereal consumption, bread consumption, milk consumption, eggs consumption, sugar consumption, fast food and soft drinks consumption. The consumption of some foods like seafood and fruits are protective of asthma, while others like fast food are associated to asthma episodes.

The environmental risk factors to which adolescents are exposed to in Yaounde were associated to the mean weight (50.26kg) and height (1.57m), physical activity, watching television, use of computers, exposure to trucks, consumption of meat, seafood, fruits, cereal, bread, eggs, milk, sugar, soft drinks and paracetamol, presence of pets at home, active smoking, with a very high prevalence of shisha or water pipe consumption of 4.8%. Also, in adolescents the consumption of some foods like seafood and fruits are protective of asthma, while others like fast food are associated to asthma episodes.

The environmental risk factors for asthma adults was associated to education background with most adults having secondary education 45.6%. The consumption of meat, seafood, fruits, cereal, bread, milk, eggs, sugar, fast food, soft drinks being either causal or protective of asthma from our study literature. Active smoking in adults was 1.2% of daily smokers with a low prevalence of shisha or water pipe smoking being 0.8%. The indoor environment of adults was a significant contributor to development of asthma; exposure to dampness, presence of mould, the use of fuels for cooking with 40.2% using firewood for cooking. Exposure to pollutants such as burning biomass solid fuels, heavy trucks pollution, dust pollution, and more triggers asthma, the worse the asthma control and poorer the quality of life among children, adolescents and adults. According to Alexander, disorders of the respiratory system leading to bronchial asthma, thus to prove that anger, guilt, aggression are expressions that are often repressed and produce a tension conducive to disorganization of the visceral organs.

To evaluate asthma management among children, adolescents and adults in Yaounde. The management of asthma varied among children, adolescents and adults. With current management having a close relation which school absence in children, adolescents and adults, work absence in adults, hospitalization in children, adolescents and adults.

Asthma management among children with asthma confirmed by doctor was higher than self-reported asthma, also asthmatic children with a written asthma plan. Still, those who used medicines was higher than self-reported asthma. Children that had Emergency Department visits in the last 12 months was 3.6% 1 to 3 times and 0.8% 4 to 12 times. This difference in asthma management being higher than self-reported cases could be attributed to the fact that most parents did not want to expose the health condition of their child directly. But given interest in the study they were able to complete other very relevant information confirming asthma actual prevalence should be higher than self-reported asthma in children. The children that inhaled SABA everyday was 14.3%. With the frequency of children missing school because of asthma being 1.2% more than 12 times in the past 12 months. Thus, making asthma very severe among children with asthma. Urgent Emergency department visits among children was 1.2% more than twice in the past 12 months confirming severity of asthma among children.

The management of asthma among adolescents considering a high prevalence of wheezing the past 12 months followed by night coughing of 40.6% in the past 12 months. The number of cases confirmed by doctor was lower than self-reported asthma, and even less adolescents had asthma management plan. The use of SABA and LABA was higher than the self-reported prevalence. The use of swallowed medicine was higher than inhaled medicine for asthma by adolescents. The absence from school due to asthma attacks was high among adolescents with 7.7% 1 to 3 times in the past 12 months. The number of Emergency Department visits was high among adolescents with 6.0% 1 to 3 times in the past 12 months.

The management of asthma in adults was higher than in adolescents with 11.8% confirmed by doctor and 8.8% having a written asthma plan. The mean age of first attacks in adults was 13.9. The use of LABA was higher than SABA. The occupation of adults had an influence on asthma episodes with 5.1% occupied jobs that cause wheezing and 8.1% leaving jobs because of breathing problems. Absenting from school was also high in adults with 1.4% missing school in the last 12 months more than 12 times due to asthma. There were lower urgent doctor visits among adults with 1.1% more than 12 times a month.

According to Alexander, disorders of the respiratory system leading to bronchial asthma to prove that anger, guilt, aggression are expressions that are often repressed and produce a tension conducive to disorganization of the visceral organs. There is a serious gap in asthma management with underdiagnoses, treatment and follow-up being inadequate, especially in adolescents. In addition to poor access to essential asthma medicines largely due to the cost,

access to adequate information that patients need to protect their health, stigma and psychological trauma remain prevalent.

LIMITATIONS

We have observed all this data, but our work in its self has minor limitations. The main limitation of this study resides in the use of screening questionnaire to diagnose asthma. This approach is subject to recall bias, but our questionnaire was adapted from internationally validated questionnaires, and which have been used in most surveys around the world, therefore allowing our results to be comparable with those from the many other studies with similar methodological approaches. The large sample is a major strength of the current study, and has allowed us to derive stable estimates of disease occurrence.

RECOMMENDATIONS

Asthma care education and awareness should be encouraged with face mask wearing as a measure to reduce exacerbation.

More diagnosis of asthma at a young age should be by free screening campaigns and promoted by the Ministry of Public Health.

Government should set up the Cameroon National Clean Air Climate Health Programme (CNCACHP) with funds to promote clean air for all. With focus on monitoring air quality at different locations in cities to forecast no go zones for patients.

Environmental health related to breathing problems like asthma should be included in school curricula from primary to university levels.

There is need for more research on breathing and environmental risk factors in Yaounde and Cameroon in general. Especially understanding COVID-19 and asthma exacerbation, climate change impacts on asthma and more.

PERSPECTIVE

Asthma episodes are rampant in Yaounde as a respiratory disease. The urgent need for attention, awareness and advocacy. The disease affects all age groups from our study with more cases noticed among adolescents, followed by adults then children. This suggest underdiagnoses which could be covered by more awareness on need for screening before adolescent age given that asthma could be of biological(genetic) but also causal factors such as psycho-social and socio-economic risk factors. With the prevalence of self-reported asthma at 3,6 % (n=2648) respondents, with 1,8%, 5,3% and 3% in children, adolescents and adults, respectively. Thus, need to accelerate implementation of World Health Organizations goal of reducing asthma by 50% by 25. There should be serious consideration to reduce this prevalence by 50% by 2025 in Cameroon.

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APPENDICES

APPENDIX ONE.

RÉPUBLIQUE DU CAMEROUN
Paix - Travail - Patrie

UNIVERSITÉ DE YAOUNDÉ I

FACULTÉ DES SCIENCES
DE L'ÉDUCATION

DIVISION DES AFFAIRES
ACADÉMIQUES DE LA SCOLARITÉ
ET DE LA RECHERCHE

LE DOYEN
The Dean



REPUBLIC OF CAMEROON
Peace - Work - Fatherland

THE UNIVERSITY OF YAOUNDE I

THE FACULTY OF EDUCATION

DEPARTMENT OF ACADEMIC
AFFAIRS, SCOLARITY AND
RESEARCH

N° _____/18/UYI/FSE/DAARS

Yaoundé, le.....

AUTORISATION DE RECHERCHE

Je soussigné, **Professeur Barnabé MBALA ZE**, Doyen de la Faculté des Sciences de l'Éducation (FSE) autorise l'étudiant (e) **ACHIBI ELVIS NDIKUM**, Matricule **16R3247** inscrit (e) en master 2 dans le Département de Éducation spécialisée, filière Intervention, Orientation et Éducation extrascolaire, à mener une recherche sur le sujet intitulé **Global surveillance of breathing and the environment in Yaounde**.

En foi de quoi la présente autorisation lui est délivrée pour servir et valoir ce que de droit./-



Mhala Le Barnabé
Professeur

APPENDIX TWO.

REPUBLIQUE DU CAMEROUN
Paix - Travail - Patrie

MINISTERE DE LA SANTE PUBLIQUE

SECRETARIAT GENERAL

DELEGATION REGIONALE DE LA
SANTE PUBLIQUE DU CENTRE

REPUBLIC OF CAMEROON
Peace - Work - Fatherland

MINISTRY OF PUBLIC HEALTH

SECRETARIAT GENERAL

CENTRE REGIONAL DELEGATION
FOR PUBLIC HEALTH

N° 00843/AP/MINSANTE/SG/DRSPC

Yaoundé, le 08 OCT 2018

Accord de principe

A

Monsieur ACHIRI Elvis NDIKUM
-Etudiant à la Faculté des Sciences de l'UY I-

Suite à votre correspondance datée du 19 septembre 2018 et relative à la demande d'une Autorisation Administrative de Recherche pour la collecte de données sur l'étude intitulé : « **Global surveillance of breathing and the environment in Yaounde** », dans le cadre de vos travaux de fin d'études en vue de l'obtention du Master 2 dans le département de l'éducation spécialisée, filière intervention, orientation et éducation extrascolaire,

J'ai l'honneur de vous signifier mon accord pour la réalisation de cette étude dans la région du Centre, en collaboration avec les responsables des structures ciblées.

Veillez agréer, Monsieur, l'expression de ma parfaite collaboration.

 LE DELEGUE REGIONAL,
Dr MOUSSI Charlotte
M.

APPENDIX THREE.

REPUBLIQUE DU CAMEROUN
Paix – Travail – Patrie
MINISTRE DE LA SANTE PUBLIQUE
SECRETARIAT GENERAL
COMITE REGIONAL D'ETHIQUE DE LA
RECHERCHE POUR LA SANTE HUMAINE DU CENTRE
Tél : 222 21 20 87/ 677 94 48 89/ 677 75 73 30
Mail : crersh_centre@yahoo.com



REPUBLIC OF CAMEROON
Peace – Work – Fatherland
MINISTRY OF PUBLIC HEALTH
SECRETARIAT GENERAL
CENTRE REGIONALETHICS COMMITTEE
FOR HUMAN HEALTH RESEARCH

CE N° 00840 / CRERSHC/2018

Yaoundé, le 04 OCT 2018

CLAIRANCE ETHIQUE

Le Comité Régional d'Ethique de la Recherche pour la Santé Humaine du Centre (CRERSH/C) a reçu la demande de clairance éthique pour le projet de recherche intitulé : « Global Surveillance of breathing and the environment in yaounde. » Soumis par Monsieur ACHIRI Elvis NDIKUM.

Après son évaluation, il ressort que le sujet est digne d'intérêt, les objectifs sont bien définis et la procédure de recherche ne comporte pas de méthodes invasives préjudiciables aux participants. Par ailleurs, le formulaire de consentement éclairé destiné aux participants est acceptable.

Pour ces raisons, le Comité Régional d'éthique approuve pour une période de six (06) mois, la mise en œuvre de la présente version du protocole.

L'intéressé est responsable du respect scrupuleux du protocole et ne devra y apporter aucun amendement aussi mineur soit-il sans l'avis favorable du Comité Régional d'Ethique. En outre, il est tenu de :

- collaborer pour toute descente du Comité Régional d'éthique pour le suivi de la mise en œuvre du protocole approuvé ;
- et soumettre le rapport final de l'étude au Comité Régional d'éthique et aux autorités compétentes concernées par l'étude.

La présente clairance peut être retirée en cas de non-respect de la réglementation en vigueur et des directives sus mentionnées.

En foi de quoi la présente Clairance Ethique est délivrée pour servir et valoir ce que de droit.

Ampliation:

- CNERSH



APPENDIX FOUR.

REPUBLIC OF CAMEROON
Paix-Travail-Patrie

MINISTRE DES ENSEIGNEMENTS SECONDAIRES

DELEGATION REGIONALE DU CENTRE

INSPECTION PEDAGOGIQUE REGIONALE
CHARGÉE DE
L'ORIENTATION ET VIE SCOLAIRES
BP 5281 Yaoundé Nlong-kak
Email : drescentz@gmail.com

REPUBLIC OF CAMEROON
Peace-Work-Fatherland

MINISTRY OF SECONDARY EDUCATION

CENTRE REGIONAL DELEGATION

REGIONAL PEDAGOGIC INSPECTORATE
IN CHARGE OF GUIDANCE
COUNSELLING AND SCHOOL LIFE
P.C.BOX 5281 Yaounde Nlong-kak

Yaoundé, le... 11 JAN 2019

N°.....135...../19/AR/MINESEC/DRES-CE/IRP-OVS.

Réf : N° 004 (A) du 07 Janvier 2019

LE DELEGUE REGIONAL
A
MONSIEUR ACHIRI ELVIS NDIKUM
Etudiant en Faculté des Sciences (Yaoundé I)
Tel : 675956499

**Objet : V/Demande d'autorisation
de recherche**

Monsieur,

En accusant réception de votre demande dont l'objet et la référence figurent en marge,

Je vous marque mon accord pour effectuer vos recherches dans les établissements scolaires relevant de ma Région de compétence.

Toutefois, j'ai l'honneur de vous inviter à prendre attache avec La Délégation Départementale du Mfoundi pour les modalités pratiques de descente dans les structures que vous solliciterez.

Veuillez agréer Monsieur, l'expression de ma considération distinguée.



LE DELEGUE REGIONAL,

*Jean Paul
Marcellin Mbada*

APPENDIX FIVE


REPUBLIQUE DU CAMEROUN
Paix-Travail-Patrie

MINISTÈRE DES ENSEIGNEMENTS SECONDAIRES

DELEGATION REGIONALE POUR LE CENTRE

DELEGATION DEPARTEMENTALE DU MFOUNDI

BP: 33 097- Yaoundé Tél: 222 22 84 70

REPUBLIC OF CAMEROON
Peace-Work-Fatherland

MINISTRY OF SECONDARY EDUCATION

REGIONAL DELEGATION OF THE CENTRE

DIVISIONAL DELEGATION OF THE MFOUNDI

P.O.BCX: 33 097- Yaoundé Ph: 222 22 84 70

Yaoundé, 13.1 JAN 2019

N° *19/L*/19/L/MINESEC/DRES-CE/DDES-MF.
Ref. : N°035/19/AR/MINESEC/DRES-CE/IPR-OVS du 11 janvier 2019.

LE DELEGUE DEPARTEMENTAL

A

MONSIEUR ACHIRI Elvis NDIKUM,
(Etudiant en Faculté des Sciences UYI)
Tel. : 675956499

Objet : *Accord pour mener une recherche dans certains établissements du département du Mfoundi.*

Monsieur,

Réitérant l'accord marqué de Monsieur le Délégué Régional des Enseignements Secondaires du Centre vous autorisant à réaliser vos recherches dans certains établissements scolaires du département du Mfoundi,

J'ai l'honneur de vous préciser que vos activités doivent être circonscrites uniquement dans les établissements dont le choix a été effectué par vos propres soins, et dans le strict respect des termes de référence de vos travaux de recherche.

En outre, vous voudrez bien me faire tenir un rapport circonstancié dès la fin de vos activités.

LE DELEGUE DEPARTEMENTAL




Dr. NDEMBA Sidonie Thérèse
PIEG H.E

APPENDIX SIX

REPUBLIQUE DU CAMEROUN
PAIX-TRAVAIL-PATRIE

MINISTERE DE L'EDUCATION DE BASE

DELEGATION REGIONALE DU CENTRE

DELEGATION DEPARTEMENTALE DU MFOUNDI

REPUBLIC OF CAMEROON
PEACE-WORK-FATHERLAND

MINISTRY OF BASIC EDUCATION

REGIONAL DELEGATION FOR THE CENTRE

DIVISIONAL DELEGATION FOR MFOUNDI

Yaoundé, le 01 0 DEC 2018

N° 084/L/MINEDUB/DREB-C/DDEB-MFDI

LE DELEGUE DEPARTEMENTAL

A

Madame L'INSPECTEUR D'ARRONDISSEMENT
DE L'EDUCATION DE BASE DE YAOUNDE VI

Objet : Autorisation d'accès dans les écoles
primaires publiques de Yaoundé VI

Dans le cadre de ses travaux de recherche sur le thème : « *Global surveillance on respiratory health and the environment* »

J'ai l'honneur de vous demander de bien vouloir permettre à l'étudiant **ACTIRI NDIKUM ELVIS, Matricule : 16.33247**, inscrit en Master II dans le Département de l'Education spécialisée, filière Intervention, Orientation et Education extrascolaire de l'Université de Yaoundé I, de bien vouloir accéder, par le truchement de vos directeurs, aux écoles primaires publiques sollicitées dans votre ressort de compétence, afin de collecter les informations nécessaires à sa recherche.

Je sais pouvoir compter sur votre diligence habituelle.

LE DELEGUE DEPARTEMENTAL,



Agallé Sylvain Pons
P.E.N.I.

APPENDIX SEVEN

REPUBLIQUE DU CAMEROUN
Paix – Travail – Patrie

MINISTRE DE L'EDUCATION DE BASE

DELEGATION REGIONALE DU CENTRE

LEGATION DEPARTEMENTALE DU MFOUNDI

INSPECTION D'ARRONDISSEMENT DE
L'EDUCATION DE BASE DE YAOUNDE I

Tél : 222 200 675



REPUBLIC OF CAMEROON
Peace – Work – Fatherland

MINISTRY OF BASIC EDUCATION

REGIONAL DELEGATION OF CENTRE

DIVISIONAL DELEGATION OF MFOUNDI

SUB-DIVISIONAL INSPECTORATE OF BASIC
EDUCATION OF YAOUNDE I
PHONE OFFICE: 222 200 675

Yaoundé le, **26 FEV 2019**
the

MADAME L'INSPECTEUR D'ARRONDISSEMENT DE YAOUNDE I

A

MADAME LA DIRECTRICE DU GSB ELITE SCHOOL NYOM

Objet : *Autorisation de recherche*

Réf : N°003/L/MINEDUB/DREB-/DDEB-MFDI

Dans le cadre de la préparation de ses travaux de recherche sous le thème : « Global surveillance of breathing and the environment in Yaounde ».

J'ai l'honneur de vous demander de bien vouloir permettre à l'étudiant **ACHIRI ELVIS NDIKUM**, Matricule **16R3247**, inscrit en MASTER 2, Département de l'Education spécialisée, filière Intervention, Orientation et Education extrascolaire, de procéder à la collecte des données relatives à son étude, dans votre école.

Il demeure bien entendu que l'intéressé devra au préalable vous expliquer dans les détails sa méthode de collecte des données afin d'arrêter de commun accord, les modalités pratiques y relatives et éviter par conséquent la perturbation des enseignements au sein de l'école.

Je sais pouvoir compter sur votre diligence habituelle.

L'INSPECTEUR

Daphine Momenou Mougue
PENI

APPENDIX EIGHT

MINISTÈRE DE L'ÉDUCATION DE BASE

DELEGATION RÉGIONALE DU CENTRE

DELEGATION DÉPARTEMENTALE DU MFOUNDI

INSPECTION D'ARRONDISSEMENT DE YAOUNDE V^o

REPUBLIQUE DU CAMEROUN
Paix - travail - Patrie

AUTORISATION DE RECHERCHE

N° 002...../AR/MINEDUB/DREB-C/DDEB-MF/IAEB-YDE V^o/BAG

Une autorisation de recherche est accordée à **Monsieur ACHIRI ELVIS NDIKUM** Matricule **16R3247**, Etudiant en Master II à l'Université de Yaoundé I, Faculté des Sciences de l'éducation, Département de l'Education spécialisée, filière Intervention afin d'effectuer des travaux recherches pour son mémoire dont le thème est « **Global surveillance of breathing and the environment in Yaounde** » dans les écoles publiques des complexes de NGOUILMEKONG et de MFANDENA II.

L'intéressé prendra attache avec les Directeurs desdites écoles pour les modalités pratiques.

En aucun cas l'ordre normal du déroulement des enseignements ne sera perturbé.

AMPLIATIONS :

- DDEB-MFOUNDI
- INTERESSEE

CHRONO

YAOUNDE, LE 08 MARS 2019

L'INSPECTEUR,



M. Elvis Ndikum
Professeur des Ecoles Normales
d'Instituteurs

APPENDIX NINE

REPUBLIQUE DU CAMEROUN
PAIX-TRAVAIL-PATRIE

MINISTERE DE L'EDUCATION DE BASE

DELEGATION REGIONALE DU CENTRE

DELEGATION DEPARTEMENTALE DU MFOUNDI

REPUELIC OF CAMEROON
PEACE-WORK-FATHERLAND

MINISTRY OF BASIC EDUCATION

REGIONAL DELEGATION FOR THE CENTRE

DIVISIONAL DELEGATION FOR MFOUNDI

Yaoundé, le 11 DEC 2018

N° 082 /L/MINEDUB/DREB-C/DDEB-MFDI



Accord
La directrice
Apo Matip Coua Salango
Yves Kangabiram
I.P.E.G.

LE DELEGUE DEPARTEMENTAL
A

Monsieur L'INSPECTEUR D'ARRONDISSEMENT
DE L'EDUCATION DE BASE DE YAOUNDE III

Vu 11 Dec 2018
accord
L'inspecteur
du Bn

Objet : Autorisation d'accès dans les écoles
primaires publiques de Yaoundé III



17 DEC 2018

Dans le cadre de ses travaux de recherche sur le thème : « Global
surveillance on respiratory health and the environment »

Gandé Okano Marim
I.P.E.G. de Yaoundé III

J'ai l'honneur de vous demander de bien vouloir permettre à l'étudiant
ACHIRI NDIKUM ELVIS, Matricule : 16R3247, inscrit en Master II dans le
Département de l'Education spécialisée, filière Intervention, Orientation et
Education extrascolaire de l'Université de Yaoundé I, de bien vouloir accéder,
par le truchement de vos directeurs, aux écoles primaires publiques
sollicitées dans votre ressort de compétence, afin de collecter les
informations nécessaires à sa recherche.

Je sais pouvoir compter sur votre diligence habituelle.

LE DELEGUE DEPARTEMENTAL,



Nguelle Nyong Roud
P.E.N.I

APPENDIX TEN

REPUBLIQUE DU CAMEROUN
Paix – Travail – Patrie

MINISTRE DE L'EDUCATION DE BASE

DELEGATION REGIONALE DU CENTRE

DELEGATION DEPARTEMENTALE DU MFOUNDI

INSPECTION D'ARRONDISSEMENT DE
L'EDUCATION DE BASE DE YAOUNDE I
Tél : 222 200 675



REPUBLIC OF CAMEROON
Peace – Work – Fatherland

MINISTRY OF BASIC EDUCATION

REGIONAL DELEGATION OF CENTRE

DIVISIONAL DELEGATION OF MFOUNDI

SUB-DIVISIONAL INSPECTORATE OF BASIC
EDUCATION OF YAOUNDE I
PHONE OFFICE: 222 200 675
Yaoundé le, 26 FEB 2019
the

MADAME L'INSPECTEUR D'ARRONDISSEMENT DE YAOUNDE I
A
MONSIEUR LE DIRECTEUR DE GBPS BASTOS GROUP 2

Objet : *Autorisation de recherche*

Réf : N°003/L/MINEDUB/DREB-/DDEB-MFDI

Dans le cadre de la préparation de ses travaux de recherche sous le thème : « Global surveillance of breathing and the environment in Yaounde ».

J'ai l'honneur de vous demander de bien vouloir permettre à l'étudiant **ACHIRI ELVIS NDIKUM, Matricule 16R3247**, inscrit en MASTER 2, Département de l'Education spécialisée, filière Intervention, Orientation et Education extrascolaire, de procéder à la collecte des données relatives à son étude, dans votre école.

Il demeure bien entendu que l'intéressé devra au préalable vous expliquer dans les détails sa méthode de collecte des données afin d'arrêter de commun accord, les modalités pratiques y relatives et éviter par conséquent la perturbation des enseignements au sein de l'école.

Je sais pouvoir compter sur votre diligence habituelle.

L'INSPECTEUR

Florence Mengue
PENN

APPENDIX ELEVEN

Achiri Elvis Ndikum

University of Yaounde 1

Faculty of Education

Tel : 675956499 /698425376

Email : achirindikum@gmail.com

Yaounde, 05 December 2018.

SUBJECT: REQUEST FOR COLLABORATION IN FILLING QUESTIONNAIRE

Dear Parents/Guardians

We are inviting you and your child to take part in an important survey about child health with the approval of your school, and would appreciate your assistance. Many schools in Yaounde are taking part in the study and some classmates of your child are being asked to take part. For each child, a parent/guardian is being asked to complete a questionnaire about their 6/7 year old. We are also asking parents/guardians to complete a questionnaire about their own health (Adult questionnaire).

If more than one child in your family has brought home Adult questionnaires for completion, we would be most grateful if you could please return the completed questionnaires together WITH the blank copies back to your child's school with ONE child as we need both the completed copies and blank copies for our records.

This survey is being carried out in randomly selected schools in other Cameroon centres and also in many overseas countries (more than 100 countries are expected to participate). The Yaounde survey is partially funded by The Association for the Promotion of Youth Leadership, Advocacy and Volunteerism Cameroon (APYLAV).

We ask you to consider this information sheet, and if you agree to take part in the survey, then we would appreciate you completing and returning the attached questionnaires. There is a questionnaire about the health of your child and we would appreciate it if one parent/guardian could complete this. In regard to the enclosed Adult questionnaires, if there are two parents/guardians living with your child we would appreciate both of you completing a questionnaire about your own health. If there is one parent/guardian at home we expect one copy of the questionnaire to be completed and returned to school. You and your child's questionnaires will be treated confidentially; only a code number will be entered in the computer. The questionnaires will be kept in a locked filing computer for 6 years in accordance with local Ethics Committee requirements.

This survey has the approval of your child's school's Board of Trustees, Principal and Teachers. It also has the approval of the Centre Regional Ethics Committee for Human Health Research (CRECHHR). phone 222 212087/677944889/677757330.

If there is any further information you require about the study, please contact one of us.

Yours sincerely

ACHIRI Elvis NDIKUM (CONTACT: 675956499/698425376, PO.BOX: 8614, Yaounde)

APPROVED BY THE CENTRE REGIONAL ETHICS COMMITTEE FOR HUMAN HEALTH RESEARCH on 04th October 2018. Reference CE N°00840/CRERSHC/2018.

APPENDIX TWELVE

Achiri Elvis Ndikum

Université de Yaoundé I

Faculté de Science de l'Education

Yaoundé, 05 Décembre 2018

Tel : 675956499 /698425376

Email : achirindikum@gmail.com

Objet: Demande de Collaboration pour remplissage d'un questionnaire

Chers parents / tuteurs,

Nous sollicitons votre participation de paire avec votre enfant à un important sondage sur la santé respiratoire de l'enfant avec l'approbation de l'école de ce dernier.

En fait, cette enquête est menée dans des écoles sélectionnées au hasard dans d'autres régions du Cameroun .De nombreuses écoles de cette ville y participent ainsi que les camarades de classe de votre enfant ayant la même tranche d'âge .Le parent / tuteur facilitera le remplissage du questionnaire pour leur enfant âgé de 6 à 7 ans, mais aussi un questionnaire sera attribué aux parents / tuteurs pour y entrer des informations sur leur propre santé.

En ce qui concerne les questionnaires pour adultes inclus, si plus d'un enfant de votre famille ramène à la maison un de nos questionnaires pour adultes nous vous prions de remplir uniquement un seul questionnaire pour adulte et renvoyer l'autre copie vierge à l'école avec l'un de vos enfants car nous en avons besoin. S'il y a deux parents / tuteurs vivants avec votre enfant, nous aimerons que vous remplissiez chacun un questionnaire pour adultes. S'il y a un seul parent ou tuteur à la maison, nous attendons de vous un seul exemplaire de questionnaire rempli et renvoyé à l'école.

Nous vous prions donc chers parents/tuteurs une lecture cette fiche d'information ; Au cas où vous accepterez de participer à l'enquête. Vos réponses et celles de votre enfant seront traitées de façon confidentielle et anonyme, c'est-à-dire un numéro de code vous sera attribué pendant l'analyse des données. Les questionnaires quant à eux seront conservés dans un ordinateur sécurisé et verrouillé pendant 6 ans conformément aux exigences du Comité d'éthique local.

Cette enquête est approuvée par le conseil d'administration, le directeur et les enseignants de l'école de votre enfant. Ainsi que l'accord du Comité Régional d'Éthique de la Recherche pour la Santé Humaine du Centre (**CRERSHC**) délivré le 04 octobre 2018. Référence EC N ° 00840 / CRERSHC / 2018 dont vous pouvez vous adresser directement au président sur ces numéros : 222 212087/677944889/677757330.

Si vous avez besoin de renseignements au sujet de l'étude, veuillez contacter l'un d'entre nous.

ACHIRI Elvis NDIKUM (CONTACT: 675956499/698425376, PO.BOX: 8614, Yaoundé)

APPENDIX THIRTEEN

GAN Phase I Monitoring Yaounde

CentreID	103003	Search Centre	
CountryNumber	103	CountryName	Cameroon
Centre Number	3	CentreName	Yaounde
Registration Doc Received Dat	20/11/2015		
13-14 PI ID	577	6-7 PI ID	577
13-14 Adult PI ID	580	6-7 Adult PI ID	580

Map Received Date 13	15/11/2019	MapDate6	15/11/2019
Centre Report Received Date	16/06/2019	ReptRecdDate6	17/06/2019
Data Received Date	14/06/2019	Data Received Date	14/06/2019
AcknowSent13	<input checked="" type="checkbox"/>	Acknowledgement Sent	<input checked="" type="checkbox"/>
Date Range	6/12/2018-17/5/2019	Date Range	1/11/2018-29/5/2019
Schools	22	Schools	27
Participants 13-14	1066	Participants 6-7	723
Participants (Adj)	1066	Participants (Adj)	722
Response Rate	99.91%	Response Rate	53.84%
NVid	1061		
AdultsIncluded13	<input checked="" type="checkbox"/>	Adults Included 6-7	<input checked="" type="checkbox"/>
Data Received Date Adults	14/06/2019	Data Received Date Adults	14/06/2019
Date Range Adults	11/2/2019-24/5/2019	Date Range Adults	1/11/2018-29/5/2019
Participant Adults	67	Participant Adults	860
Participant Adults (Adj)	67	Participant Adults (Adj)	793
Excluded 13-14	<input type="checkbox"/>	Excluded 6-7	<input type="checkbox"/>
Excluded 13-14 Adults	<input type="checkbox"/>	Excluded 6-7 Adults	<input type="checkbox"/>

Report Accepted Date	8/06/2020	ReptOKDate6	8/06/2020
DataSent 13-14	<input checked="" type="checkbox"/>	DataSent 6-7	<input checked="" type="checkbox"/>
DataSentDate13	28/06/2019	Data Sent Date 6-7	28/06/2019
DataSentLocation13	London	Data Sent Location 6-7	London
Data Sent 13 Adults	<input checked="" type="checkbox"/>	Data Sent 6 Adults	<input checked="" type="checkbox"/>
Data Sent Date 13 Adults	28/06/2019	Data Sent Date 6 Adults	28/06/2019
Data Sent Location 13 Adults	London	Data Sent Location 6 Adult	London

Data Summary Received	<input checked="" type="checkbox"/>	Data Summary Received	<input checked="" type="checkbox"/>
Data Summary Received Adult	<input checked="" type="checkbox"/>	Data Summary Received A	<input checked="" type="checkbox"/>

Centre Report to P	Map OK	Data OK 13-14	ChecksOK13	Centre Report to PI	Map OK	Data OK 6-7	ChecksOK6
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>

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