

LIFESTYLE DISEASES IN ADOLESCENTS: DISEASES, DISORDERS, AND PREVENTIVE MEASURES



Editors:
Aditi Singh
Abhishek Nandy

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Lifestyle Diseases in Adolescents: Diseases, Disorders, and Preventive Measures

Edited by

Aditi Singh

&

Abhishek Nandy

*Amity Institute of Biotechnology
Amity University Uttar Pradesh, Lucknow Campus
Lucknow-226028
India*

**Lifestyle Diseases in Adolescents: Diseases,
Disorders, and Preventive Measures**

Editors: Aditi Singh & Abhishek Nandy

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PREFACE

Lifestyle-related diseases, also known as non-communicable diseases (NCDs), are increasingly affecting adolescents worldwide. The rise of these conditions in adolescents is driven by various factors related to modern lifestyles, and it presents significant public health challenges globally. Addressing lifestyle-related diseases in adolescents requires a multifaceted approach involving individual, community, and policy-level interventions. In 2005, the World Health Organization (WHO) estimated that 61 per cent of all deaths -- 35 million -- and 49 per cent of the global burden of disease were attributable to chronic diseases. By 2030, the proportion of total global deaths due to chronic diseases is expected to increase to 70% and the global burden of disease to 56%. Chronic conditions like Asthma affects about 14% of children globally, making it one of the most common chronic conditions in youth and Around 0.6% of children and adolescents worldwide have active epilepsy. Early prevention and health promotion strategies are crucial to curbing the rising trend of NCDs and ensuring a healthier future generation.

While developed countries have higher rates of adolescent obesity, developing countries are catching up due to urbanization and changes in dietary patterns. Early onset of LSRDs leads to a longer duration of illness and complications, reducing the quality of life and increasing healthcare costs. Adolescents with LSRDs are more likely to experience morbidity and premature mortality in adulthood.

Recently it was observed that the youth are suffering from many lifestyle-related diseases (LSRDs). Neurological disorders, diabetes, hypertension, heart disease, infertility, and hormonal imbalance problems such as Poly Cystic Ovary Syndrome (PCOS) are all common outcomes of unhealthy lifestyle choices.

The objective of the book “Lifestyle Related Diseases in Adolescents: Diseases, Disorders, and Preventive Measures” is to provide a comprehensive overview of the various health issues and diseases that are influenced by lifestyle factors in adolescents. The lifestyle related disease among adolescents is a serious threat. An updated understanding is the need of time and crucial for setting the groundwork for policy formulation for long-term public health. There are twelve chapters in which we have taken a multicentric approach with topics ranging from dental health, diabetes during adolescence, cancer, bronchial toxicity to heart diseases, neurological disorders, GIT diseases, ovarian syndrome and infectious diseases.

Aditi Singh

&

Abhishek Nandy

Amity Institute of Biotechnology
Amity University Uttar Pradesh, Lucknow Campus
Lucknow-226028
India

List of Contributors

Abhishek Nandy	Amity Institute of Biotechnology, Amity University Uttar Pradesh, Lucknow Campus, Lucknow-226028, India
Amarjit Singh	Department of Centre for Medical Biotechnology, Maharshi Dayanand University, Rohtak, Haryana, India
Amisha Mishra	Department of Zoology, Deccan Education Society's Fergusson College, Pune, India
Chhavi Shukla	Amity Institute of Biotechnology, Amity University Uttar Pradesh, Lucknow Campus, Lucknow-226028, India
Divyansh Verma	Amity Institute of Biotechnology, Amity University Uttar Pradesh, Lucknow Campus, Lucknow-226028, India
Hera Fatma	Department of Biotechnology, Dr. Ambedkar Institute of Technology for Handicapped, Kanpur, India
Isra Aman Aziz	Amity Institute of Biotechnology, Amity University Uttar Pradesh, Lucknow Campus, Lucknow-226028, India
Juhi Verma	Department of Chemistry, Babu Banarasi Das University, Faizabad Road, Lucknow-226028, India Department of Biochemistry, Dr. Ram Manohar Lohia Institute of Medical Sciences, Gomti Nagar, Lucknow-226010, India
Kuhu Panchadhyai	Department of Microbiology, St. Xavier's College, Kolkata, India
Manish Dwivedi	Amity Institute of Biotechnology, Amity University Uttar Pradesh, Lucknow Campus, Lucknow-226028, India
Manish Raj Kulshrestha	Department of Biochemistry, Dr. Ram Manohar Lohia Institute of Medical Sciences, Gomti Nagar, Lucknow-226010, India
Nishtha Sah	Department School of Health Sciences and Technology, University of Petroleum and Energy Studies (UPES), Dehradun, India
Palak Mishra	Amity Institute of Biotechnology, Amity University Uttar Pradesh, Lucknow Campus, Lucknow-226028, India
Palak Sachdeva	Amity Institute of Biotechnology, Amity University Uttar Pradesh, Lucknow Campus, Lucknow-226028, India
Pallabi Chatterjee	School of Health Sciences and Technology, University of Petroleum and Energy Studies (UPES), Dehradun, India
Pragyan Paliwal	Department of Conservative and Endodontics, Babu Banarasi Das College of Dental Sciences, Lucknow, India
Prankur Awasthi	Amity Institute of Biotechnology, Amity University Uttar Pradesh, Lucknow Campus, Lucknow-226028, India
Pratyaksha Srivastava	Department of Biotechnology, Dr. Ambedkar Institute of Technology for Handicapped, Kanpur, India
Saba Hasan	Amity Institute of Biotechnology, Amity University Uttar Pradesh, Lucknow Campus, Lucknow-226028, India
Sakshi Singh	Accord Super Specialty Hospital, Faridabad, Haryana, India

- Shivani Singh** Amity Institute of Biotechnology, Amity University Uttar Pradesh, Lucknow Campus, Lucknow-226028, India
Department of Biochemistry, Dr. Ram Manohar Lohia Institute of Medical Sciences, Gomti Nagar, Lucknow-226010, India
- Shazia Syed** Amity Institute of Biotechnology, Amity University Uttar Pradesh, Lucknow Campus, Lucknow-226028, India
- Shivangi Gusain** Department of Biosciences, University Institute of Biotechnology, Chandigarh University, Mohali, India
- Swati Gupta** Department of Prosthodontics, Babu Banarasi Das College of Dental Sciences, BBD University, Lucknow, India
- Vandana Tiwari** Department of Biochemistry, Dr. Ram Manohar Lohia Institute of Medical Sciences, Gomti Nagar, Lucknow-226010, India
- Varad Vardhan Bisen** Department of Pathology, Amar Shaheed Jodha Singh Ataiya Thakur Dariyav Singh Medical College, Fatehpur, India

CHAPTER 1**Microbiome in Teenagers – Acquisition and Development****Pallabi Chatterjee^{1,*}, Isra Aman Aziz², Amarjit Singh³ and Aditi Singh²**¹ School of Health Sciences and Technology, University of Petroleum and Energy Studies (UPES), Dehradun, India² Amity Institute of Biotechnology, Amity University Uttar Pradesh Lucknow Campus, Lucknow-226028, India³ Department of Centre for Medical Biotechnology, Maharshi Dayanand University, Rohtak, Haryana, India

Abstract: Adolescence is the stage of life between childhood and adulthood, ranging from 10 to 19 years. It is a distinct period in human development and crucial for setting the groundwork for long-term health. Teenagers grow quickly in terms of their physical, cognitive, and emotional development. In the body of teenagers, major changes in microorganisms take place. With the development of these changes in the microbiome of teenagers, diseases are also developed. Teenagers are the future of the world. Microbiota and diseases have an impact on their emotions, thoughts, decisions, and interactions with others and their environment. This chapter is written to acknowledge the readers about the resident microorganisms of the human body during adolescence and the many kinds of changes that occur in the microbiome due to lifestyle changes.

Keywords: Adolescence, Microorganisms, Microbial diseases.

1. INTRODUCTION

The human microbiome is a vast and complex community of microorganisms, including bacteria, archaea, fungi, and viruses, that reside on and within our bodies. These tiny organisms outnumber human cells by 10 to 1 and play a crucial role in our health and well-being. Microbes inhabit various body sites, including the gut, skin, mouth, and respiratory tract. Each site has a unique microbiome composition adapted to its specific environment (Dekaboruah *et al.*, 2020). The microbiome performs diverse functions, including aiding in digestion and nutrient absorption, regulating the immune system, protecting against pathogens, and even

* **Corresponding author Pallabi Chatterjee:** School of Health Sciences and Technology, University of Petroleum and Energy Studies (UPES), Dehradun, India, Tel: +91 7980175343; E-mail: pallabi.118372@stu.upes.ac.in

influencing mood and behavior. A balanced and diverse microbiome is associated with good health, while disruptions can contribute to various diseases, such as obesity, inflammatory bowel disease, and allergies. Diet, lifestyle, medications, and even age can all influence the composition and function of the microbiome. Studying the human microbiome is a rapidly growing field with the potential to revolutionize our understanding of health and disease. By understanding and nurturing our microbiome, we may be able to improve our overall health and well-being in profound ways. The teenage microbiome is a dynamic and evolving ecosystem undergoing significant changes during puberty due to hormonal shifts, dietary habits, and lifestyle factors (Yue and Zhang, 2024). Here is a glimpse into the unique characteristics of a teenager's microbiome:

- **Shifting composition:** Compared to childhood, the gut microbiome in adolescence exhibits a decrease in beneficial bacteria like Bifidobacteria and an increase in Firmicutes, which can influence metabolism and weight regulation.
- **Impact of diet:** Teenage dietary choices significantly impact the gut microbiome. A diet rich in fruits, vegetables, and whole grains promotes a diverse and healthy microbiome, while sugary and processed foods can contribute to harmful bacterial overgrowth.
- **Stress and the microbiome:** The teenage years are often marked by increased stress, which can disrupt the gut microbiome and contribute to digestive issues and inflammation.
- **The gut-brain connection:** The gut microbiome plays a crucial role in brain development and function during adolescence. Studies suggest that a healthy microbiome may positively impact mood, cognitive function, and mental well-being.

2. THE NORMAL MICROBIOME OF ADOLESCENCE

The microbes that live on body surfaces protected by epithelial cells are considered to be members of the normal microbiome. They are found in the systems that are exposed to the outside environment, such as the gastrointestinal tract, respiratory system, vagina, and skin. More bacteria may be present on mucosal and skin surfaces than human cells (Tannock, 1999). The average human body has roughly 10^{13} cells and about 10^{14} bacteria (Davis, 1996). Commensal bacteria evolve together with their hosts, but under some circumstances, they are able to get past the host's defenses and cause pathology. Local bacteria create intricate ecosystems with a huge diversity. The distal portions of the gut contain the largest microbiome, and a great deal of the microbes in the gut are gram-negative anaerobes (Pasparakis *et al.*, 2014). Conventional microbiological methods are unable to cultivate more than 50% of gut bacteria. Numerous elements of the local microbiome are capable of triggering both innate and

adaptive immunity. Every individual has a diverse microbial flora on their skin and mucous membranes from soon after birth until death (Davis, 1996; Naik *et al.*, 2012). The typical microbial flora is made up of this particular bacterial population. The typical microbial flora is rather constant, with distinct genera inhabiting different bodily locations at different times of a person's life (Fyhrquist *et al.*, 2014). In spite of the fact that the majority of the typical microbial flora that lives in the human skin, nails, eyes, oropharynx, genitalia, and gastrointestinal system is harmless in healthy people, these organisms commonly cause illness in weak hosts. Most researchers do not consider viruses and parasites to be part of typical microbial fauna since they are not considered commensal and do not benefit the host (Palm *et al.*, 2015).

2.1. Resident Flora

- They consist of relatively fixed types of microorganisms regularly found in each area at a particular age (Fig. 1). If disturbed, it promptly re-establishes itself.
- If the resident flora is disturbed, transient microorganisms may colonize, proliferate and produce disease.
- Regularly present in a particular part of the body
- They prevent or suppress the colonization or invasion of the body by other pathogens.
- They produce antibodies and raise the immune status of the body against pathogens having related antigens.
- These microorganisms become opportunistic pathogens and cause clinical disease when they enter a different habitat.

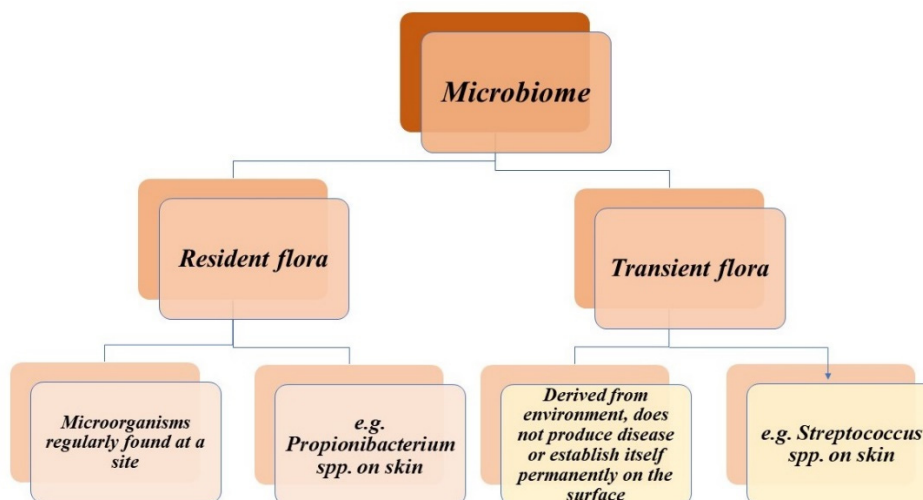


Fig. (1). Resident flora vs. transient flora.

Neurological Disorders and Epilepsy among Adolescents

Abhishek Nandy¹, Chhavi Shukla¹ and Aditi Singh^{1,*}

¹ Amity Institute of Biotechnology, Amity University Uttar Pradesh, Lucknow Campus, Lucknow-226028, India

Abstract: Adolescence includes phases of both significant social role shifts and biological growth, both of which have evolved over the previous 100 years. A relatively prevalent neurologic condition throughout adolescence is epilepsy. Growth, hormonal, psychological, and social circumstances all undergo significant change during adolescence. It can be extremely challenging for many young women with epilepsy to manage the developmental and emotional challenges of adolescence while still having to deal with the reality of seizures, medication, stigma, and restriction. These young women's everyday functioning and quality of life are further impacted by the additional load of comorbidities like depression. It is crucial to spend time with these teenagers discussing the effects of epilepsy and giving them the information and resources they need to succeed in regaining their confidence and control over their lives. Teenagers frequently struggle to embrace the chronic nature of their epilepsy and to take their medications as prescribed, which can lead to bodily harm and real or imagined barriers to employment and lower morale. Additionally, it was discovered that children and teenagers with epilepsy are more likely to exhibit depressive and anxious symptoms. Additionally, teenagers also suffer from other neurological disorders that are common but less reported, like multiple sclerosis. The aim of this chapter is to focus on some of the neurological diseases that are present mainly in the adolescent period mainly epilepsy and some other neurological diseases.

Keywords: Adolescence, Epilepsy, Growth, Hormones, Neurological disorders, Psychological, Social, Stigma, Teenagers, Teenagers.

1. INTRODUCTION

Adolescence is a tough stage of life, especially when it is accompanied by a chronic condition. Societal pressure is at its height, independence is emerging, driving and employment are now feasible, and the discovery of relations and sexuality has just begun (Sheth and Gidal, 2006). Because growing brain, behavioral, and cognitive systems age on different timelines and are governed by

* **Corresponding author Aditi Singh:** Amity Institute of Biotechnology, Amity University Uttar Pradesh, Lucknow Campus, Lucknow-226028, India; Tel: +91 8303981347; E-mail: asingh3@lko.amity.edu

both common and independent biological processes, adolescence is frequently a time of significantly increased susceptibility (Steinberg, 2005). Human adolescence starts when puberty first appears and concludes when a person firmly commits to an adult role. Adolescence thus has boundaries that are both biological and psychosocial. Social-psychological studies have shown that children become more self-conscious and aware of others' opinions throughout and after puberty (Damon, 2004). The neurocognitive components of adolescent self-processing have been the subject of recent empirical studies. According to much research, adolescence is a time of ongoing self-development and growing interdependence between one's own and other people's mental states (Vartanian, 2000).

Finding your place in society and becoming independent can be especially difficult during adolescence. Epilepsy, which is among the more prevalent chronic pediatric diseases, and the treatments it requires during adolescence present a potential window of vulnerability that may impede the growth of psychosocial freedom and biological and physiological maturational processes like skeletal growth and reproductive hormone balance (Baker *et al.*, 2005; Sheth *et al.*, 2008; El-Khayat *et al.*, 2004). Around 50 million people worldwide suffer from epilepsy, a chronic noncommunicable brain condition. Recurrent seizures are its defining feature (Fig. 1). Seizures are brief bursts of spontaneous movement that might affect either a portion of the body (partial) or the entire body (generalized), and they can occasionally be followed by the loss of consciousness and control over bowel or bladder function (World. Epilepsy. WHO, 2022). Persons with epilepsy make up over 80% of the population in low- and medium-income nations. Epilepsy is stigmatized in many cultures, and as a result, some people may not seek treatment. Over 75% of people with active epilepsy go untreated, which represents a significant treatment gap that is primarily found in low- and middle-income nations (Fisher *et al.*, 2014; Saxena, 2017). The World Health Organization urged all governments to address the unique needs of epilepsy patients. In 2015 the WHO, the International League Against Epilepsy, and the International Bureau for Epilepsy launched the Global Campaign Against Epilepsy in 1997 (Board, 2015).

For those who had an age-dependent syndrome but are no longer under the relevant age and are seizure-free, or in other cases of epilepsy, for those who have been seizure-free for the previous 10 years without using medication for the past 5 years, epilepsy is deemed resolved (Fisher *et al.*, 2014). People are merely reported to experience epilepsy, even though the diagnosis should be as specific and accurate as possible. Three categories are used for classification: syndrome, epilepsy type, and seizure type. Cause and comorbidities should be determined at each stage because they may have significant therapeutic consequences. Genetic, structural, metabolic, infectious, immunological, and unidentified are the six types

of causes (Scheffer *et al.*, 2017). First, seizures are divided into three groups based on their onset: focal, generalized, or unidentified. Focused seizures in people with retained awareness and those with impaired awareness are separated by level of awareness. By the earliest and most noticeable motor or non-motor manifestation, acute seizures are further divided into different categories. Depending on the level of detail that is provided, each classifier is optional (Fisher *et al.*, 2017). Motor and non-motor (absence) seizures are two categories of generalized seizures. Unidentified onset seizures may nevertheless have distinguishable characteristics. Someone presenting with convulsions without any clinical indication of a focused or generalized onset is a frequent occurrence. These seizures fall under the category of tonic-clonic seizures with uncertain onset (Fisher *et al.*, 2017). Four categories of epilepsy exist focal, generalized, combination generalized and focal, and unknown (Fig. 2). For patients who present with both seizure types, the new category of mixed generalized and focal epilepsy is employed (Sarmast *et al.*, 2020). Epilepsy syndrome can be identified with the greatest degree of accuracy. The diagnosis is made based on a collection of clinical characteristics, such as the age of onset, the kind of seizure, comorbidities, EEG, and imaging characteristics (Stafstrom *et al.*, 2015).

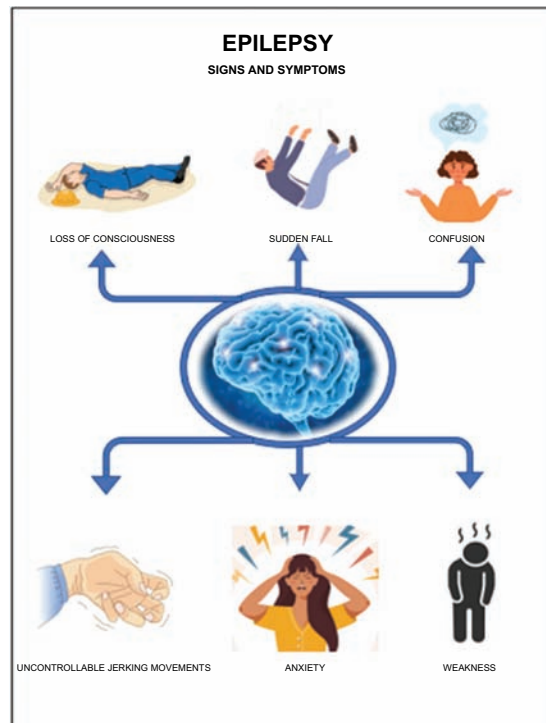


Fig. (1). Signs and Symptoms of Epilepsy.

CHAPTER 3

Lifestyle-Associated Dental Diseases in Adolescents

Pragyan Paliwal^{1,*} and Swati Gupta²

¹ Department of Conservative and Endodontics, Babu Banarasi Das College of Dental Sciences, BBD University, Lucknow, India

² Department of Prosthodontics, Babu Banarasi Das College of Dental Sciences, BBD University, Lucknow, India

Abstract: The lifestyle is the standard of living, conduct, and practice of an individual person or a set of people that are usual or are selected by them. Lifestyle is a culture based on the living conditions, and the conduct of a person is determined by ethnographic factors and the individual temperament of a person. Oral diseases are closely related to lifestyle. Oral hygiene can be maintained by innocuous choices in relation to food, smoking tobacco, and the usage of dental health services. The changes in lifestyle have disturbed the balance of the metagenome of the microbiota and human host. This section examines the role of various factors in dental health, including lifestyle and behavioral factors.

Keywords: Adolescence, Dental disorders, Lifestyle, Oral health.

1. INTRODUCTION

The definition of lifestyle in Cambridge Thesaurus is ‘A set of attitudes, habits, moral standards, economic level, or assets associated with a particular person or group’. It narrates the mode of living; such attitudes may be required or in fashion or an opulent manner of living. According to the International Dental Federation, “Oral health is multifaceted and includes the ability to speak, smile, smell, taste, touch, chew, swallow, and convey a range of emotions through facial expressions with confidence and without pain, discomfort, and disease of the craniofacial complex”.

Adolescence is an intermediate stage of growth and development that bridges childhood and adulthood. The World Health Organization (WHO) categorizes youth into 10 to 19 years old. According to the statistics of the World Health Organization, the number of young people in the world is about 7.2 billion, of which more than 3 billion are under the age of 25, making up 42% of the people

* Corresponding author Pragyan Paliwal: Department of Conservative and Endodontics, Babu Banarasi Das College of Dental Sciences, BBD University, Lucknow, India; Tel: +91 9454288772; E-mail: pragya.plwl@gmail.com

in the world. One or two billion people between the ages of 10 and 19 make up 16 percent of the world's population.

According to the literature, lifestyle diseases are termed as one's lifestyle-related diseases. According to the National Institute of Health, Lifestyle diseases are characterized as those diseases whose occurrence is primarily based on the daily habits of people and are a result of an inappropriate relationship of people with their environment.

Comprehensive human health includes oral cavity wellness and it cannot be considered in isolation. In the 21st century, the policy of the World Health Organization (https://apps.who.int/gb/ebwha/pdf_files/WHA74/A74_R5-en.pdf) to improve oral health says that Oral health should be combined with overall health because health is related to lifestyle. Oral health problems are caused by some underlying problems, and changes in some risk factors can be beneficial for many diseases (Baskaradoss *et al.*, 2019). Inactivity, smoking, tobacco, pan supari and poor diet are important factors for many oral diseases. An increase in the consumption of sugary foods, especially baked goods and carbonated beverages, increases the prevalence of dental caries. Therefore, a healthy lifestyle is central to public health.

Due to unhealthy dietary patterns, dental caries is considered a disease of childhood and adolescence. Poor oral hygiene from childhood to adulthood leads to the accumulation of plaque and tartar, which are the main causes of gingivitis (inflammation of the gums) and periodontitis (inflammation of the peridontium). Significant evidence indicates that dental caries affects the majority of the population of varied races, genders, geographic regions, and socioeconomic status. The various lifestyle changes affect the oral microbiome. The different lifestyles perturb the collaboration between the microbiomes and their hosts. Due to the different styles of living, the flora also changes from being less diverse to more pathogenic. In the present scenario, the oral microbiome is more carcinogenic (Tables 1 & 2).

2. CLASSIFICATION

Table 1. Lifestyle, oral diseases and prevalence rate with age groups (<https://www.who.int/team/noncommunicable-diseases/global-status-report-on-oral-health-2022>).

Age	Lifestyle	Oral Diseases	Prevalence Rate
10-12	Road traffic accidents Drowning Tobacco use	Dental Trauma Dental Trauma & Erosion Stains, Fibrosis, Mucosal atrophy,	31.7–64.2% 20-30% more than 26% in competitive swimmers &

(Table 1) cont....

Age	Lifestyle	Oral Diseases	Prevalence Rate
		Oral ulceration, erythematous lesions of soft palate & pharynx, Angular cheilitis	10% in recreational swimmers. 36.36%
12-15	Violence Alcohol and drug use Mental health problems, illness and disability Obesity and overweight Junk food and drinks Smoking Stress	Dental Trauma Dental Caries Gingivitis & Periodontitis Dental Erosion Stains & Fibrosis, Oral Cancer Malocclusion Attrition	18% 57% 73% 40-55% 66.2%
15-19	Road traffic accidents and Violence Junk food & Drinks Stress	Dental Trauma Fractures Dental Caries Dental Erosion Attrition	22% 48-66% 40-55%
20-24	Violence Alcohol and drug use	Dental Trauma Dental Caries & Oral Cancer	57.8% 89.61%

Table 2. Oral diseases with their respective symptoms and management.

Oral Diseases	Symptoms	Management
Dental Erosion	Dentin Hypersensitivity, perimolysis (dental erosion on palatal surfaces of teeth) sensitivity and caries	Restorations, laser, Desensitizing toothpaste
Dental Caries	Initial Caries- no symptoms, discoloration, softening, cavities in teeth, sensitivity, pain,	Oral antiseptics (e.g., Listerine), root caries can be treated with fluoride gel and varnish and toothpaste restorations, root canal treatment.
Dentofacial Injuries	Pain discoloration, fracture	Surgeries, RCT, Splints
Stains	Discoloration	Bleaching, veneers
Oral Cancer	Non-healing ulcer or mass Exophytic Growth, Pain	Refer for biopsy, staging, excision, surgical approach
Gingivitis	Inflammation and erosion of gums, bleeding gums, halitosis, redness	Good oral hygiene including brushing and flossing daily, scaling.
Periodontitis	Bleeding gums, Mobility of Teeth, Erosion of Cementum, Halitosis	Good oral hygiene, including brushing and flossing daily, scaling, and curettage.

Association of Pesticides with Adolescent Asthma and Bronchial Hyper-Reactivity

Shivani Singh^{1,3}, Juhi Verma^{1,2}, Vandana Tiwari^{1,*} and Manish Raj Kulshrestha¹

¹ Department of Biochemistry, Dr. Ram Manohar Lohia Institute of Medical Sciences, Gomi Nagar, Lucknow 226010, India

² Department of Chemistry, Babu Banarasi Das University, Faizabad Road, Lucknow 226028, India

³ Amity Institute of Biotechnology, Amity University Uttar Pradesh, Lucknow Campus, Lucknow 226028, India

Abstract: Lung exposure to airborne toxins from various sources in the environment can lead to acute and chronic pulmonary or even systemic inflammation. The environment contains several compounds that might irritate the respiratory system, including heavy metals and agrochemicals in adolescents. Toxicants can induce respiratory illnesses and airway inflammation, which alters either the structure, function, or composition of the body. Because of their long-term physical development, the developing immune and respiratory systems are particularly vulnerable to various environmental toxins. They promote the accumulation and activation of several allergy indicators (eosinophil count, IgE, and numerous cytokines), which may be used to potentially trigger lung inflammation. This chapter describes the impact of various toxic substances on the airway and pulmonary system. Also, we have covered specific pulmonary toxins, toxicants, and toxin combinations. The concluding section of the chapter emphasizes raising awareness of the dangers and adverse effects toxicants may have on health as well as encouraging more efforts to reduce exposure to adolescents. Metropolitan residents use pesticides for the prevention of mosquitoes, ticks, ants, and cockroaches. Reducing indoor allergens and pollution can lower asthma treatment costs and severity.

Keywords: Adolescent asthma, Asthma treatment, Asthma control and management, Occupational exposure, Pyrethroids, Pesticides.

* Corresponding author Vandana Tiwari: Department of Biochemistry, Dr. Ram Manohar Lohia Institute of Medical Sciences, Gomi Nagar, Lucknow 226010, India; Tel: +91 9415197228; E-mail: drvandana2166@yahoo.com

1. INTRODUCTION

From embryonic life to adolescence, the development of the lungs is a continual process. Around 85% of a human being's alveoli are present at birth. While lung surface area and alveolar number increase during childhood, they start to flatten between the ages of 2 and 4, while lung expansion continues until age 8 (Marshall *et al.*, 1978). Immature (neonatal) differentiating cells of the respiratory tract are more susceptible to exposure to respiratory toxins and injury than mature cells at a lower dose of pesticide levels that produce no effect in adult cells (Schuepp *et al.*, 2012). Children usually engage more in physical activity and are exposed to respiratory irritants. Children have a faster metabolic rate than adults, which accounts for breathing more rapidly and breathing in more pollutants per kilogram of body weight (Sly *et al.*, 2008). Their narrower airways can be more easily obstructed than in adults. Thus, because of lung immaturity during childhood and greater exposure relative to body weight in children compared to adults, it is hypothesized that children may be more vulnerable to exposure to respiratory toxins than adults. Various chronic diseases in children have been observed, including birth defects, cancer, asthma, and developmental disabilities like autism and a maximum of these conditions originate from environmental factors (Croen *et al.*, 2005; Chenoweth *et al.*, 2009). Among all, asthma is the most common one and is majorly caused by environmental toxicants like pesticides causing air pollution, polycyclic biphenyls, and exposure to various toxic metals (Yu *et al.*, 2011). Early childhood exposure to environmental toxins may have an impact on how the immune system develops and may play a role in the emergence of certain disorders like asthma.

Asthma is a chronic respiratory disease characterized by the narrowing and obstruction of the airways by excessive mucus. It has many indicators and therapies mentioned in Fig. (1). It is mainly marked by recurrent attacks of bronchial constriction resulting in shortness of breath, dyspnea, and coughing. In some cases, the disease is dangerous and might be life-threatening. Various studies from India have reported the prevalence of asthma varying from 3.5% to 29.5% (Vyankatesh *et al.*, 2017). If you don't seek medical treatment for your asthma, it can be life-threatening. These three disorders, usually associated with seasonal allergies (allergic rhinitis) and eczema (atopic dermatitis), are known as the atopic triad (Spergel *et al.*, 2010). Asthma patients may experience a variety of respiratory symptoms such as wheezing, shortness of breath, cough, and chest tightness. The frequency and severity of symptoms vary, but uncontrolled asthma and acute exacerbations can lead to respiratory failure and death. Children below the age of 15 years generally come in the phase of developing organs so they are not able to completely detoxify the hazardous toxicants (Sly *et al.*, 2008). Both genetics and the environment can play a role in the development of asthma

(Martinez *et al.*, 2007). Some children are genetically predisposed to asthma and allergies, but genetic alterations take several generations to affect the entire population whereas the Environmental Protection Agency (EPA) has identified pesticides as one of four environmental toxins that might trigger or exacerbate asthma attacks (Dietert *et al.*, 2008).

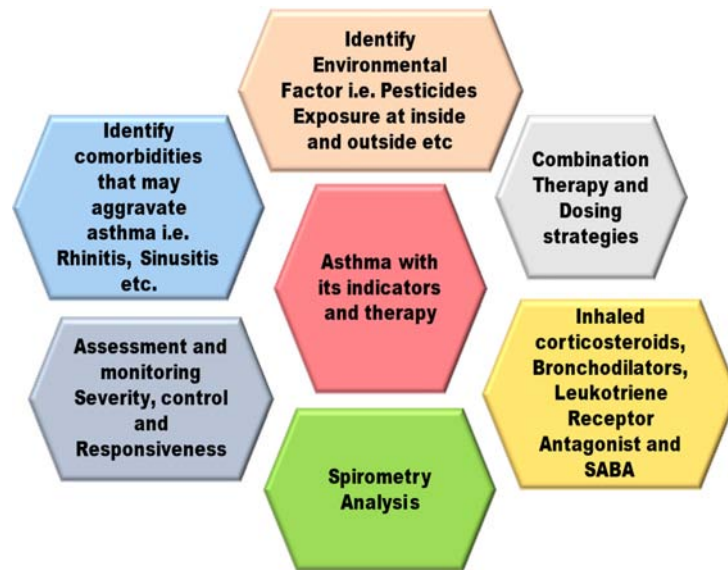


Fig. (1). Asthma cycle with its indicators and therapy.

1.1. What is an Asthma Attack?

The muscles that surround your airways relax when you breathe regularly, allowing air to pass through them quietly and easily. There are three possible outcomes during an asthma attack:

- **Bronchospasm:** The muscles that surround the airways tighten; when they contract, your airways constrict.
- **Inflammation:** The lining of your airways swells. Swollen airways limit the amount of air that can pass through your lungs.
- **Mucus production:** During an attack, your body produces more mucus. This thick mucus blocks the airways.

Wheezing is the sound made by constricted airways during inhalation and exhalation. A severe attack of asthma is often known as an exacerbation or a flare-up. This is a reference to the condition of uncontrolled asthma.

Cancer in Adolescents

Prankur Awasthi^{1,*} and Saba Hasan¹

¹ Amity Institute of Biotechnology, Amity University Uttar Pradesh, Lucknow Campus, Lucknow-226028, India

Abstract: Cancer may become the cause of death due to lifestyle changes among adolescents. It is becoming widely understood that our lifestyle choices have a big impact on our likelihood of getting cancer. Numerous unavoidable risk factors are responsible for most malignancies; however, to lower the likelihood of getting cancer, we may alter our lifestyle. Having a balanced diet, controlling your weight, exercising regularly, abstaining from alcohol, and avoiding tobacco use are all examples of healthy lifestyle choices that can reduce your risk of acquiring cancer. Using information from human research, we give data in this chapter on the correlation between specific lifestyle factors and their contribution to the development of prostate, breast, colon, and lung cancers.

Keywords: Alcohol, Diet, Lifestyle, Obesity, Smoking.

1. BACKGROUND

The prevalence of cancer in adolescents (15-19-year-olds) is almost twice as high as that of 5 to 14-year-olds; they do not yet have the same explicit research and care organizations as pediatric patients who are younger (Albritton and Bleyer 2003). Additionally, these people are more likely to have a variety of behavioral and lifestyle issues, such as poor eating, inactivity, and substance addiction (Klosky *et al.* 2012).

It is becoming more widely recognized that changing one's lifestyle might alter cancer risk factors. Many genes related to development are altered in tumor cells, creating differences between them and their healthy cells. It is well known that repeated mutations in cellular genes, like oncogenes and tumor suppressor genes, can lead to malignant transformation (Futreal *et al.* 2004).

The vast differences in specific cancer rates between nations and the correspondingly dramatic shifts in incidences of cancer among populations

* Corresponding author Prankur Awasthi: Amity Institute of Biotechnology, Amity University Uttar Pradesh, Lucknow Campus, Lucknow-226028, India; Tel: +917007749504; E-mail: prankur.awasthi@s.amity.edu

moving to places with disparate rates have generated a great deal of interest in nutrition and human cancer over the past few decades. In addition to demonstrating the biological basis for the reported link, identifying the mechanisms through which lifestyle choices affect cancer risk will also provide proof of causation, which will help determine the best cancer prevention recommendations for the general public. In this chapter, we emphasise the data from human studies that identify the main risk factors that can be changed to reduce the incidence of cancers of the breast, prostate, lung, and colon. Improving diet, managing weight, and reducing alcohol use are the primary susceptibility indicators that can be changed to lower the risk for these types of tumors. Chemopreventive drugs offer substantial cancer-preventive capabilities that could halt various stages of cancer, according to several studies (Khan *et al.* 2008a; Khan *et al.* 2008b; Surh 2003).

2. LIFESTYLE FACTORS CAUSING CANCER IN ADOLESCENTS

2.1. Obesity

A major global health issue is obesity. According to the Global Burden of Disease Study, there were 603.7 million adults who were obese worldwide in 2015 or 12% of the population. Since 1980, the childhood obesity incidence has risen in more than 70 different nations. According to the most recent data, there are 115.1 million obese children worldwide, which equals a 5% global prevalence (A *et al.* 2017; Forouzanfar *et al.* 2016). Obesity was shown to be the cause of roughly 4 million fatalities globally in 2015 (Weihrach-Blüher *et al.* 2019). Alarmingly, there is growing evidence that juvenile obesity or even overweight is linked to greater mortality and morbidity in adulthood, notably an increased risk for cancer (Preuss *et al.* 2010). According to the GLOBOCAN 2012 report, an elevated BMI is responsible for roughly 500,000 occurrences of cancer worldwide (Arnold *et al.* 2015). An investigation by the American Cancer Society found a link between obesity and higher mortality rates from malignancies of the breast (in postmenopausal women), colon, endometrial, esophagus (adenocarcinoma), kidneys (renal cell), prostate, pancreas, gastric cardia, gallbladder, and liver (Calle *et al.* 2003). The rate of cancer types associated with obesity is higher in high-income nations than in low-income ones (5–6% in Europe vs. 1-2% in Africa) (Preuss *et al.* 2010). In many emerging nations, the proportion of overweight persons has increased along with modernization and a Westernised lifestyle and diet (Drewnowski and Popkin 1997). Many investigations have revealed that neurochemicals, insulin, insulin-like growth factor 1 (IGF-1), and sex steroids, leptin, insulin resistance, adiposity, and inflammation are the factors linking obesity with cancer (Stephen D. Hursting *et al.* 2007). Leptin/JAK/STAT, IGF/insulin/Akt, and other inflammatory cascades, as well as other signaling

pathways, have all been connected to both cancer and obesity (Stephen D. Hursting *et al.* 2007). For instance, it has been demonstrated that hyperglycemia activates NF-kB (Nareika *et al.* 2007), which might connect cancer with fats. Cytokines produced by several adipocytes, including leptin, TNF, and IL-1, are also known to promote NF-kB (Tang *et al.* 2007). Carcinogenesis and energy balance have a tight relationship (Stephen D. Hursting *et al.* 2007). The question of whether these signaling cascade inhibitors can lower the risk of cancer due to obesity is yet open. Given the participation of numerous signaling pathways, a possible medication with several targets will probably be required to lower the cancer risk associated with obesity.

2.2. Diet

A study in 1981 concluded that in the USA, 35 percent of deaths caused by cancer occurrence were related to nutrition (Doll and Peto 1981). According to cancer type, the extent to which nutrition affects cancer mortality varies greatly (Havas 2000). For instance, up to 70% of cases of colon cancer may be caused by nutrition-related factors. It is not entirely clear how nutrition regulates cancer risk. Most ingested carcinogens, like nitrosamines, nitrates, dioxins, and pesticides, originate in food and additives. Consumption of heavy red meat raises the chance of developing a number of cancers, including prostate (Rodriguez *et al.* 2006), colorectal (Bingham *et al.* 2002; Chao *et al.* 2005; Hogg 2007), breast (Tappel 2007), gastric (O'Hanlon 2006), pancreatic, bladder (García-Closas *et al.* 2007), and oral (Toporcov *et al.* 2004) cancers, as well as cancers of the gastrointestinal tract. Although a different study identified that consuming meat lessens the likelihood of developing lung cancer, it is still widely believed that doing so poses a danger of developing cancer for various reasons (Dasil-Díaz *et al.* 2007). Carcinogens are present in cooked meat, namely heterocyclic amines. Smoke-cured or charcoal-cooked meat can produce harmful compounds of carbon including pyrolysates and amino acids, which are very carcinogenic in nature. As an example, 2-amino-1-methyl-6-phenyl-imidazo[4,5-b] pyridine (PhIP) represents 20% of the total cooked beef's mutagenesis potential and is one of the most frequent mutagenic agents consumed by masses. According to estimates, Americans consume 280–460 ng/day of PhIP on average (Lauber and Gooderham 2007). Yet, nitrites and nitrates are strong cancer-causing agents and are utilised in meat because they attach to myoglobin and stop the development of exotoxin *i.e.*, botulinum (Divisi *et al.* 2006). The induction of cancer has been linked to long-term contact with additives of food such as nitrite preservatives and azo dyes (Sasaki *et al.*, 2002). In addition, the bisphenol found in food containers made of plastic can contaminate food and raise the risk of breast and prostate cancer (Durando *et al.*, 2007; Ho *et al.*, 2006). Consumption of arsenic raises the chance of developing bladder, lung, liver, and kidney cancers (Szymańska-Chabowska *et*

Hypertension and Cardiovascular Problems - An Outlook Associated with Adolescents' Lifestyles

Hera Fatma¹, Pratyaksha Srivastava¹, Parul Johri^{1*}, Manish Singh Rajput¹, Shazia Syed² and Mala Trivedi²

¹ Department of Biotechnology, Dr. Ambedkar Institute of Technology for Handicapped, Kanpur, India

² Amity Institute of Biotechnology, Amity University Uttar Pradesh, Lucknow Campus, Lucknow-226028, India

Abstract: The outlook of present-day adolescents' lifestyles is certainly the outcome of unhealthy childhood. The consequences of it are leading adolescents to hypertension and cardiovascular diseases. There are several contributing elements to the complicated and varied conditions of hypertension. Hypertension is increasing consistently in children and may persist into adulthood. Cardiovascular problems are heart-related issues such as cardiac conditions, stroke, endocarditis, irregular heartbeat, and more. Cardiovascular diseases are the main complications caused by hypertension. Weight control, lowered blood pressure, enhanced emotional wellness, and a propensity for more physical activity in maturity are all health advantages of an active lifestyle for teenagers. The possibility to stratify cardiovascular disease risk is the main justification for detecting high blood pressure in most children and adolescents in the future. The studies have shown enough evidence of anatomical and functional alterations in the cardiovascular system that signify early atherosclerosis in youth. According to clinical research, numerous variables that contribute to hypertension interact with one another, negatively impacting the cardiovascular system in people.

Due to vascular blockage, cardiovascular disorders can cause hemorrhagic or ischaemic disorders in the heart, brain, and other sections affecting vascular tissue. Basic clinical manifestations can no longer be utilized as a standard characteristic to assess individuals who have acute coronary atherosclerosis, hypertension, and cardiovascular disease. Due to arterial blockage, cardiovascular disorders can cause hemorrhagic or ischemic conditions in the heart, brain and other vascularly connected tissues. Teenagers' heavy consumption of alcohol and cigarettes, overweight or obese, diabetes, hypertension, hyperlipidemia, and other risk factors are the primary cause of cardiovascular disease in adults. Hypertension has a major negative impact on patients' health, which is directly tied to the prevalence of cardiovascular disease. This paper aims to emphasize the outcomes of an unhealthy adolescent lifestyle that consecutively leads to lifestyle-associated problems, especially hypertension and cardiovascular

* **Corresponding author Parul Johri:** Department of Biotechnology, Dr. Ambedkar Institute of Technology for Handicapped, Kanpur, India; Tel: +91 9838144680; E-mail: pjohri.14@gmail.com

issues. The studies help give a precise output of the analysis of what preventive measures need to be taught to adolescents for a healthier and better future.

Keywords: Adolescents, Cardiovascular, Hypertension.

1. INTRODUCTION

Adolescents are a major population around us that need special attention and care in terms of lifestyle and behavioral patterns. This period of abrupt physical and physiological changes marks early diagnosis as mandatory, such that it does not lead to the long-term consequences of untreated hypertension. Research has highlighted the fact that pediatric hypertension diagnosis indicates some serious underlying medical conditions and cardiovascular issues that can be prevented by early diagnosis (Ewald & Haldeman, 2016). Obesity or overweight among adolescents is a major factor for childhood hypertension and cardiovascular issues due to fat and cholesterol accumulation. This directly influences body metabolism and blood pressure. The increased consumption of fast foods and prepared foods and high sodium intake cause significant changes in family structures. However, hypertension remains an important risk factor in adolescents as there are other root causes like peer pressure, social issues, cultural heritage, and other confounding influences of gender and genetics. Persistent high blood pressure in childhood will affect the patient's vascular pressure and, in addition to that, deposition of cholesterol in blood vessels leads to heart ischemia and hypoxia, resulting in atherosclerosis and blockage (Wang & Wang, 2022).

The complexity of diagnosing and treating pediatric hypertension has several challenges for clinicians, including the proper measurement of BP, mediating positive lifestyle changes, defining hypertension in adolescents, preventing target organs, and determining when to use pharmacologic interventions to control BP (Hardy & Urbina, 2021). Timely screening of elevated blood pressure and hypertension helps in preventing cardiovascular diseases. Cardiovascular health is directly influenced by the diet and lifestyle of the person. Hypertension, CVD, and stroke are preventable with regular intake of fruits and vegetables that are found to be protective against them. There are significant variations in global practices for hypertension care wherein stages, including population BP screening, follow-up of elevated BP readings, diagnosis of hypertension, management of hypertension, and adequate BP control, stand the same for all (Robinson & Chanchlani, 2022). In addition to the confirmation of hypertension, its severity can be monitored, and abnormal circadian blood pressure patterns and masked hypertension are detected. This highlights the connectivity between ambulatory hypertension and cardiovascular target organ damage in both children and adolescents. Therefore, from a future perspective, working on early BP

screening, detection of prehypertension, and implementing a metabolically healthy diet in adolescents can help prevent cardiovascular risk and also target organ damage at such an early age (Gokalp *et al.*, 2021).

2. ADOLESCENT LIFESTYLE

Adolescents, mostly falling in the age group 16-18, are likely to suffer from lifestyle issues. At present, the main reasons for disturbed adolescent lifestyles are drinking, smoking, obesity, hypertension, diabetes, hyperlipidemia, and so on. The emotional, mental, and physical state of an adolescent depends majorly on diet and nutrition. This phase of life encounters remarkable physical and psychological changes in the individual, that is by the influence of peers and society. Other contributing factors are overweight and obesity, metabolic and genetic factors, racial and cultural influences, metabolic and genetic factors, status, *etc.* The growth rate and pubertal stage of adolescents also have a greater influence and make diagnosis quite challenging. Thus, hypertension in adolescents far exceeds the number who have been diagnosed.

Mental illnesses like depression, hypertension, and psychosis onset at the age of adolescence. Hypertension is a complex disease with many contributing factors in adolescents. Similarly, precursors of cardiovascular risk factors are seen in childhood and may continue into adulthood. The complications in hypertension consecutively lead to cardiovascular diseases in adolescents. If the treatment is not done on time, patients may have a variety of more serious complications such as stroke, heart failure, coronary heart disease, and even myocardial infarction.

2.1. Factors Associated with Adolescent Lifestyle

Adolescent lifestyle is greatly influenced by society, peers, school, and the surrounding people. Nowadays, social media plays a crucial role in influencing the lifestyle of adolescents. Some of the major factors associated with adolescent lifestyle are:

Family and Surrounding- Families can play a significant role in helping adolescents to make a healthier lifestyle. Educating families and society about the significance of a healthier adolescent lifestyle is important. Mostly family programs promote alterations in the family environment to help children and families change their behaviors in case of an unhealthy lifestyle.

Internet and Social-media- Internet usage by adolescents is increasing day by day which has both positive and negative impacts on their lifestyle. Social networking has led to the dismal involvement of adolescents in extra-curricular activities. As these activities are direct indicators of positive development, it is

Functional Gastrointestinal Disorders and Diseases in Adolescents

Nishtha Sah^{1,*}, Kuhu Panchadhyai² and Abhishek Nandy³

¹ Department School of Health Sciences and Technology, University of Petroleum and Energy Studies (UPES), Dehradun, India

² Department of Microbiology, St. Xavier's College, Kolkata, India

³ Amity Institute of Biotechnology, Amity University Uttar Pradesh, Lucknow Campus, Lucknow-226028, India

Abstract: The medical professional continues to see a lot of adolescents with gastrointestinal illnesses, which have a big emotional and financial toll. One cannot overstate how crucial it is to identify gastrointestinal disorders correctly. Diseases like Lactose intolerance and Celiac disease cause nutrition deficiency among many adolescents. Gastrointestinal disorders are illnesses that comprise a variety of chronic or recurrent symptoms that cannot be fully explained by structural or biochemical research at this time. One cannot overstate the significance of correctly diagnosing gastrointestinal diseases in children. Children and their parents need to be aware that their diagnosis is not only psychological but also medical. The physiological and psychological factors that contribute to symptom manifestation must be considered throughout management and therapy. The chapter focuses on illnesses that affect adolescents, including appendicitis and ailments of the colon, rectum, small and large intestines, and stomach.

Keywords: Adolescence, Deficiency, Gastrointestinal disorders.

1. INTRODUCTION

Children and adolescents with gastrointestinal (GI) diseases can suffer from a wide range of digestive issues from infancy to age 18. In addition to symptoms including discomfort, nausea, vomiting, diarrhea, constipation, and difficulty with the passage of food or feces, or a combination of symptoms, the illnesses may impede everyday functioning. Some of these illnesses are uncommon, while others are extremely prevalent. At least forty to fifty percent of visits to a juvenile gastroenterologist may be for GI issues, the majority of which are accompanied

* **Corresponding author Nishtha Sah:** Department School of Health Sciences and Technology, University of Petroleum and Energy Studies (UPES), Dehradun, India; Tel: +91 9410731311; E-mail: nishtha.118358@stu.upes.ac.in

by stomach discomfort (Fig. 1). Some GI conditions are rather typical. 10-25% of all kids who receive treatment from a juvenile gastroenterologist have constipation. Irritable bowel syndrome (IBS) affects youngsters at a similar incidence as adults.

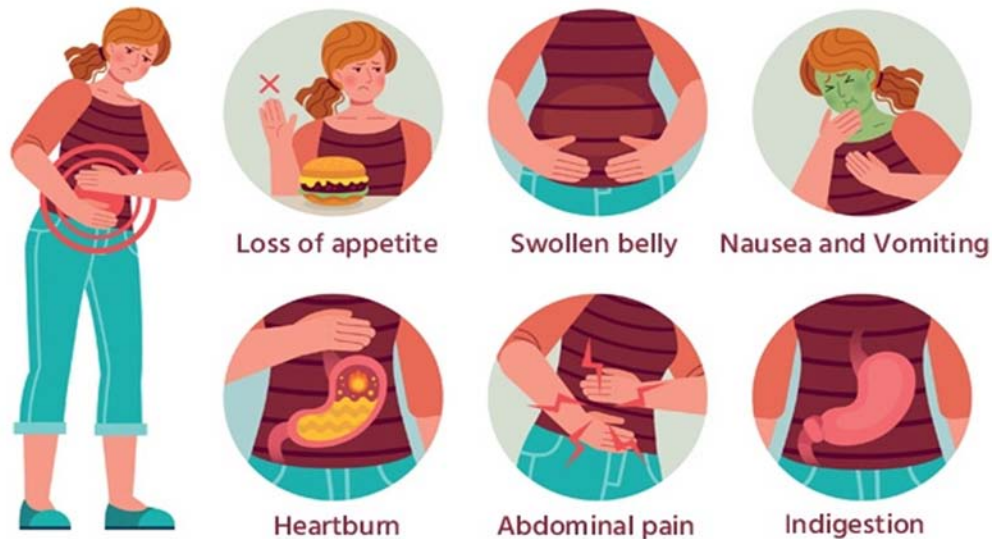


Fig. (1). The common symptoms associated with gastrointestinal disorders among adolescents.
Source: <https://www.medicoverhospitals.in/diseases/gastrointestinal-disease/> (accessed on February 5, 2024)

An individual's propensity for developing adult functional gastrointestinal diseases is influenced by both heredity and early life events. Early childhood events have an impact on the nervous system and brain development. The incidence or degree of later gastrointestinal problems in adults may be prevented or reduced with early, effective therapies in children (Warren, 1965).

2. LACTOSE INTOLERANCE

The amount of lactose in one or two quarts of milk is too much for a person with lactose intolerance to properly digest. Teenagers who are American Jews, Eskimo people, American Indians, American Blacks, and certain Asians are lactose intolerant. By the time a person was 13 years old, this indication of insufficient lactose digestion was close to 50% and reached over 86% in adults (Bayless, 1982). When exposed to a little lactose load, such as one glass of milk, many lactose-intolerant teens do not experience any symptoms.

Common symptoms after consuming lactose-containing foods include gas and stomach pain, increased gas, and loose stool. Lactose intolerance is frequently

diagnosed with a detailed medical history and dietary modifications. If required, the diagnosis can be confirmed with a lactose tolerance test or an inhalation hydrogen test. The mainstay of therapy is to avoid meals containing lactose. Lactase enzyme supplements may be beneficial. People with lactose intolerance exhibit varying degrees of malabsorption of lactose, while the majority of them may consume up to 250 mL of milk each day without suffering any symptoms (Swagerty *et al.*, 2002).

Patients with lactose intolerance need to get enough calcium. Use of lactase-treated milk and milk products and lactase supplements, restriction of lactose-containing diets, or dairy omission are all forms of treatment. Doctors recommend dairy products as a key source of calcium for strong bones and other nutrients that promote children's and teenagers' growth. Other food sources of calcium or calcium supplements must be offered if dairy products are removed (Heyman, 2006).

3. CELIAC DISEASE

Gluten, which is included in many grains including wheat, barley, rye, sorghum, or millet, cannot be digested by the small intestine in people with celiac disease (CD). In people with a genetic predisposition, gluten-containing cereals cause celiac disease, an immune-mediated systemic condition. When a newborn first eats gluten-containing cereal, CD symptoms may at first manifest in them. Irritability, inadequate weight growth, and even weight loss are possible symptoms. Chronic diarrhea is a common complaint in children and adolescents, while some individuals also have constipation. Some kids may vomit, experience discomfort or distension in their abdomen, or have pale or unpleasant-smelling feces (Laass *et al.*, 2015).

Long-term untreated celiac disease poses a number of health hazards, including lymphoproliferative disorders, even in the absence of clinical signs. There is growing evidence that development and bone quality might be negatively impacted in kids identified by screening. It sometimes takes years before celiac disease symptoms are recognized in individuals because the symptoms become so vague (Moreno, 2014).

Frequently, laboratory testing is required for diagnosis. A blood test to check for excessive levels of antibodies, the immune system proteins that may respond to gluten, could be advised by a doctor. The doctor can suggest referring the patient for additional assessment to a gastroenterologist. A biopsy is an additional possible test that entails taking a sample of tissue from the small intestine using a tiny tube called an endoscope. The only way to cure CD is to completely avoid all gluten-containing foods for the rest of your life, including bread, spaghetti, cereal,

Diabetes and its Associated Gastrointestinal Disorders in Adolescents

Divyansh Verma^{1,*}, Palak Mishra¹, Palak Sachdeva¹, Abhishek Nandy¹ and Varad Vardhan Bisen²

¹ Amity Institute of Biotechnology, Amity University Uttar Pradesh, Lucknow Campus, Lucknow-226028, India

² Department of Pathology, Amar Shaheed Jodha Singh Ataiya Thakur Dariyav Singh Medical College, Fatehpur, India

Abstract: An adolescent with diabetes faces very different challenges than a young adult or grownup with diabetes. Failure to acknowledge and address this will result in noncompliance and absence from the clinic. Type I diabetes is the most prevalent metabolic illness in childhood and adolescence, although Type II diabetes in adolescents is frequently associated with obesity, which may contribute to these increased risks. Obesity impairs the body's capacity to utilize insulin, resulting in elevated blood sugar levels. Among younger people, early identification of type II diabetes as well as dedication to controlling overweight and obesity are critical. As a result, a number of people with diabetes mellitus who have had it for a long time experience chronic and recurrent clinical symptoms related to the disordered motility of almost the entire GI tract, such as esophageal and epi-pharyngeal dysphagia, gastroparesis, constipation, diarrhea, and fecal incontinence. Dietary changes are one of the therapeutic methods used to treat chronic recurrent symptoms caused by autonomic dysfunction. Dietary manipulations and several medications, including dopamine antagonists, antibiotics, and hormones, promote peristalsis. On the other hand, gastrointestinal symptoms related to acute metabolic problems are self-limited and resolve quickly after the normal metabolic environment has been restored.

Keywords: Adolescence, Gastrointestinal diseases, Type I Diabetes, Type II Diabetes.

1. INTRODUCTION

The metabolic disease known as diabetes mellitus is complicated (Fig. 1a) and characterized by persistent hyperglycemia brought on by deficiencies in insulin production, insulin action, or both. Insufficient insulin action on target tissues

* Corresponding author Divyansh Verma: Amity University Uttar Pradesh, Lucknow Campus, Lucknow-226028, India; Tel: +91 8299593268; E-mail: 01divyansh03@gmail.com

results from inadequate insulin production and/or reduced tissue responses to insulin in the intricate hormonal action pathways, which causes anomalies in protein, fat, and carbohydrate metabolism. In the same patient, decreased insulin production and/or action may coexist (Mayer-Davis *et al.*, 2018). Type I and type II are the major forms of this metabolic disorder (Fig. 1b). Type 1 diabetes, formerly known as juvenile-onset diabetes or insulin-dependent diabetes, is a metabolic condition characterized by the immune system's destruction of islet cells in the pancreas, which are responsible for producing insulin. This autoimmune process eventually leads to a deficiency in insulin production. Type 1 affects a smaller percentage (5-10%) of individuals with diabetes, however, it is higher in children and adolescents diagnosed with diabetes (<https://www.cdc.gov/diabetes/basics/type1.html>). Whereas, Type 2 diabetes, previously referred to as adult-onset or noninsulin-dependent diabetes, is not confined to adulthood anymore. Its onset can occur at any age, including childhood, a trend that's unfortunately increasing. This type of diabetes is characterized by insulin resistance, wherein the body's cells become less responsive to insulin signals, leading to improper glucose utilization. With the gradual increase of Type 2 diabetes, the pancreas may also reduce the production of insulin, exacerbating the condition. The prevalence of Type 2 diabetes is alarmingly on the rise and is closely linked to factors like obesity and unhealthy lifestyle habits, which increase the risk, particularly among children (<https://www.cdc.gov/diabetes/basics/type2.html>). In a recent cross-sectional study on the prevalence of Type 1 and Type 2 diabetes in children and adolescents from 2001 to 2017 in six different regions in the US, it was observed that there had been a marked rise in Type 1 diabetes, which rose from 1.48 to 2.15 cases per 1000 individuals aged 19 or younger. Similarly, the estimated prevalence of Type 2 diabetes among those aged 10 to 19 years increased from 0.34 to 0.67 cases per 1000 young people (Lawrence *et al.*, 2021).

Typical symptoms of diabetes in adolescent individuals include polyuria, polydipsia, nocturia, enuresis, and weight loss, which may be accompanied by polyphagia, behavioral disturbances, including decreased academic performance, and impaired eyesight. Along with prolonged hyperglycemia, growth impairment and susceptibility to certain infections are possible side effects. The type of diabetes that a teenager is diagnosed with is typically determined by their presentation characteristics; however, in recent years, factors such as the rising prevalence of overweight in type 1 diabetes among teenagers and the presence of diabetic ketoacidosis in some young people at the time of diagnosis of type 2 diabetes have made it more difficult to make a clinical diagnosis (World Health Organization., 2006).

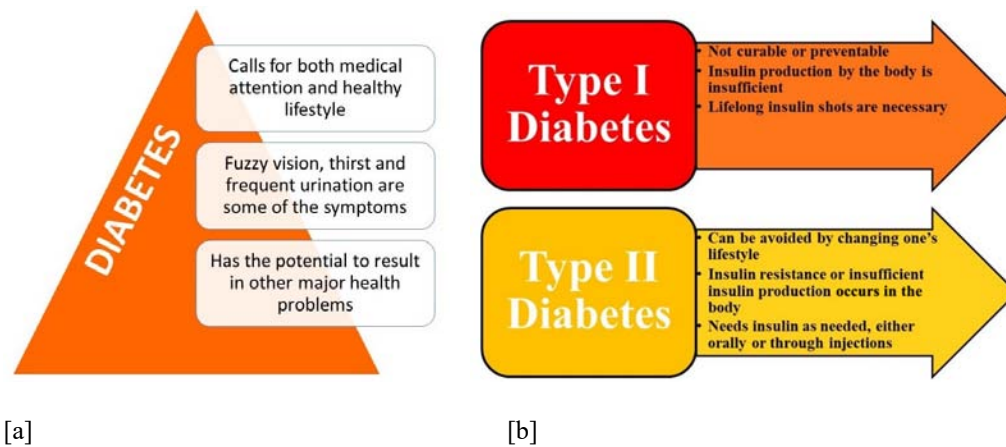


Fig. (1). **a:** Diabetes is a chronic disorder with severe consequences; **Fig. 1b:** Major features of the two forms of diabetes seen in adolescents.

2. EPIDEMIOLOGY OF DIABETES IN ADOLESCENCE

2.1. Type 2 Diabetes

Worldwide, there are significant differences in the prevalence and incidence of type 2 diabetes in young people across nations, age groups, and ethnic groups (Zeitler *et al.*, 2014). In some at-risk communities, type 2 diabetes is on the rise and causes a sizable part of diabetes in adolescents. According to the findings of epidemiologic studies, the incidence of type 2 diabetes in children as well as adolescents ranges from 1 to 51 per 1000. In the US, Canada, Japan, Austria, UK, and Germany, there has been an increase in the incidence of type 2 diabetes in pediatric patients (Pulgaron *et al.*, 2014). In recent years, the prevalence of type 2 diabetes in adolescents and kids has rapidly grown all over the world, especially among obese young people and reports estimate an occurrence rate of 0.4 – 1% of obese children of ≥ 12 years suffering from type II diabetes (Reinehr, 2013). In a recent study by Wu *et al.* (2022) on worldwide incidence in adolescents and kids, it was reported that 41,600 new cases of type II diabetes were diagnosed globally, out of which 30% were from the International Diabetes Federation Western Pacific region and 40% cases were from World Bank upper-middle-income countries. It was also reported that China, India and USA have the highest estimated cases of adolescent type II diabetes (Wu *et al.*, 2022).

2.2. Type 1 Diabetes

The estimated yearly incidence of type 1 diabetes in children under the age of 15 is 96,000 globally. In the majority of Western nations, type 1 diabetes accounts

CHAPTER 9

Polycystic Ovarian Disease Associated with Adolescent Lifestyles

Sakshi Singh¹, Vartika Nishad², Parul Johri², Ritesh Pandey³ and Mala Trivedi^{3,*}

¹ Accord Super Specialty Hospital, Faridabad, Haryana, India

² Department of Biotechnology, Dr. Ambedkar Institute of Technology for Handicapped, Kanpur, India

³ Amity Institute of Biotechnology, Amity University Uttar Pradesh, Lucknow Campus, Lucknow-226028, India

Abstract: Among women of reproductive age, polycystic ovarian syndrome (PCOS) is one of the most prevalent endocrinological diseases. It is a metabolic and endocrine disorder in women that affects hormone levels. PCOS comes with many comorbidities, which include obesity, which has been associated with an increased risk of cardiovascular disease, diabetes, and metabolic abnormalities, as well as a reduced response to reproductive therapy such as laparoscopic ovarian diathermy, gonadotropins, and clomiphene citrate. Genetic, dietary modification, lifestyle, and obesity play an important role in causing PCOS in women. Women with PCOS are more likely to have mood disorders than other women, including bipolar disorders, depression, and anxiety, and worse quality-of-life ratings. Adolescent growth and well-being are significantly impacted by depression. Studies have shown that women with PCOS are more likely to have increased carotid intima-media thickness and elevated coronary artery calcium scores. Menstrual abnormalities, increased androgen symptoms, and infertility are all improved by losing weight. Management of clinical manifestations of PCOS includes oral contraceptives for menstrual irregularities and hirsutism. Recent data suggest that proper diagnosis and management of PCOS are essential to address patient concerns and prevent future metabolic, endocrine, psychiatric, and cardiovascular complications.

Keywords: Adolescents, Polycystic ovarian syndrome.

1. INTRODUCTION

The lifestyle that most of us lead might be really good, but this lifestyle in itself is a disorder. Unhealthy dietary habits, less physical activity, an irregular sleep

* **Corresponding author Mala Trivedi:** Amity Institute of Biotechnology, Amity University Uttar Pradesh, Lucknow Campus, Lucknow-226028, India; Tel: +91 8887506713; E-mail: pjohri.14@gmail.com

cycle, overdependence on technology, and many more have resulted in the rise of lifestyle-related disorders. Problems like diabetes, hypertension, obesity, thyroid disease, PCOS, osteoporosis, and various cardiovascular diseases are all associated with lifestyle disorders. (Stephenson *et al.*, 2018). It is directly associated with the way people lead their lifestyles. Diseases caused by a sedentary lifestyle are now affecting children as well as adults. We have all fallen victim to some incredibly rare diseases that we had never even heard of before. One of the most common problems associated with multiple disorders today is obesity. It is mainly caused by unhealthy eating habits, a stressful lifestyle, and reduced physical activity (de Zegher *et al.*, 2018, Ajmal *et al.*, 2019). Type I diabetes and type II diabetes are the two main kinds of the disease. Juvenile diabetes is another name for type I diabetes. Type II diabetes is the most common type and has strong links with obesity (Yilmaz *et al.*, 2018). General symptoms are increased hunger, increased thirst, weight loss, frequent urination, blurry vision, and tiredness (Setji and Brown, 2014).

When blood pressure reaches unhealthy levels, it is referred to as hypertension, or high blood pressure. It is generally a silent condition. One can have high blood pressure for years without any symptoms (Macut *et al.*, 2019). Only a small percentage of persons with high blood pressure have headaches and shortness of breath. Heart disease and stroke risk are both increased by hypertension. Stroke occurs due to the blockage and causes a decrease in the brain's blood supply (Amiri *et al.*, 2020). The general symptoms of stroke or heart diseases can be chest pain, a slow heartbeat, or shortness of breath (Amiri *et al.*, 2020). Menstrual irregularities, excessive hair growth, acne problems, and obesity are all signs of PCOS, or polycystic ovarian syndrome. Cancer is a result of a weak immune system or a stressful lifestyle (Dewailly *et al.*, 2010). Other common diseases are related to the thyroid (Stephenson *et al.*, 2018). The two main thyroid diseases are hypothyroidism and hyperthyroidism. Symptoms related to hypothyroidism include tiredness, weight gain, intolerance to cold temperatures, and hair loss. Anxiety, nervousness, trouble sleeping, losing weight, or muscle weakness are symptoms of hyperthyroidism (Elting *et al.*, 2003). At present, one out of every four Indians faces body aches, acute stress, a constant cold and cough, overweight issues, or digestive concerns.

The metabolic and endocrine condition like polycystic ovarian syndrome (PCOS) in women impacts hormone levels. This can occur at any age, starting after the menarche and continuing through the menopause (Ajmal *et al.*, 2019). A genetic, dietary modification, lifestyle, and also obesity play an important role in causing polycystic ovary syndrome. The function of ovary is to release the egg and hormonal synthesis. These two factors may interfere with the polycystic ovarian syndrome. Due to polycystic ovary syndrome, the patients often suffer from lower

stomach pain, difficulties in urination, irregular periods, and hormonal imbalance (Christensen *et al.*, 2013).

2. PCOS: CAUSES AND COMORBIDITIES

A hormonal condition called PCOS results in enlarged ovaries with tiny cysts on the periphery. The prefix 'poly' means many or multiple, 'cyst' refers to cysts, and the suffix 'ic' means pertaining to (Dewailly *et al.*, 2010). Ovarian cysts or cysts in the ovary are the cause of PCOS, a syndrome. It is the most common endocrinological disorder in reproductive-age women worldwide. Often times, women are affected by acne, hirsutism, or excessive hair growth in this condition (De Leo *et al.*, 2016). These androgens lead to altered and increased troponin levels, which leads to issues with ovulation. It can prevent or inhibit ovulation from occurring. Hormonal changes in PCOS may lead to infertility, type 2 diabetes, heart diseases, cholesterol abnormalities, and an increased risk of endometrial cancer (Setji and Brown, 2014).

2.1. Causes of PCOS:

There is no recognised cause for PCOS. There is research that suggests a major contributing factor to PCOS that may be heredity. Several other factors, most importantly obesity, also play a role in causing PCOS (Christensen *et al.*, 2013): Genetic Factors, it was found that in monozygotic twins or identical twins, if one twin has PCOS, the other twin is highly likely to also have PCOS as well. So that, it indicates there's a genetic component involved in PCOS. Excess of male hormones is also one of the important causes of PCOS, that leads to various physical expressions *viz.* over growth of body hairs and facial hairs (Azziz *et al.*, 2009). Higher insulin concentration is also one of the causes of this disease. It was found that more than 70% women with this disease showed insulin resistance, therefore, insulin is not properly utilized by cells, and the demand of insulin in body thus keeps on increasing, that stimulates pancreas for more insulin production (Yilmaz *et al.*, 2018). Obesity is another cause of PCOS. Pre-pubertal obesity, along with environmental factors, has a great contribution to PCOS (de Zegher *et al.*, 2018).

2.2. PCOS: Associated Comorbidities

Some of the Associated Comorbidities or Conditions to Occur in Patients with PCOS are:

Common Infectious Diseases and Clinical Microbiology of Adolescence

Shivangi Gusain^{1,*}, Shreetama Bhattacharjee², Amisha Mishra³, Abhishek Nandy² and Aditi Singh²

¹ Department of Biosciences, University Institute of Biotechnology, Chandigarh University, Mohali, India

² Amity Institute of Biotechnology, Amity University Uttar Pradesh, Lucknow Campus, Lucknow 226028, India

³ Department of Zoology, Deccan Education Society's Fergusson College, Pune, India

Abstract: Controlling communicable diseases has long been a priority for international health policy. The burden and mortality of communicable diseases have significantly decreased among children under the age of five, but older children and adolescents are subject to greater disease burden, and it is unclear whether current policies and programs continue to be in line with intervention targets. There is compelling evidence that suggests bacteria have a role in a number of chronic, non-infectious disorders, including coronary heart disease, neurological disorders, and a few types of cancer. Teenagers all around the world suffer from various diseases caused by microorganisms. The diseases are caused due to the change in lifestyle. Amidst tremendous physiological change and growth, the young adult is exposed to a range of stressors and environmental factors. Diseases like tuberculosis, urinary tract infection, candidiasis, influenza, and AIDS are very common among adolescents and affect millions of teenagers across the world. Some of the diseases like sexually transmitted illness, Ringworm, and Mononucleosis are very alarming for adolescents as most of the teens across the world are suffering at a staggering rate. This chapter is written to inform the readers about the common diseases caused by microorganisms in the teenage years due to lifestyle changes.

Keywords: AIDS, Adolescence, Microorganism, Tuberculosis, Urinary Tract Infection.

1. INTRODUCTION

Infectious diseases continue to plague populations around the world as we reach the twenty-first century. Biological dangers, both naturally occurring and intentio-

* Corresponding author Shivangi Gusain: Department of Biosciences, University Institute of Biotechnology, Chandigarh University, Mohali, India; Tel: +91 8588048338; E-mail: shivangigusain07@gmail.com

nally introduced, have a rising potential to inflict sickness, disability, and death. Beyond disease, infectious pathogens' power to destabilize societies, economies, and governments is quickly becoming a dismal reality. Infectious disease prevention and control are critical to individual, national, and global health and security; failure to recognize and act on this fundamental truth will almost certainly result in calamity (de Martel *et al.*, 2012).

Microbial dangers are continually emerging, reemerging, and persisting. Some microbes create completely unknown diseases in humans, while others are previously known pathogens infecting new or larger populations or expanding into new geographic areas. The overlapping realms of infection determinants such as genetic and biological variables; physical environmental elements; ecological factors; and social, political, and economic aspects all influence the microbe-host interaction. Microbes, with their extraordinary adaptability, can spread swiftly and win strongholds to become endemic diseases, as the decades-long pandemic of human immunodeficiency virus (HIV) infection and acquired immunodeficiency syndrome (AIDS) has proved (Khabbaz *et al.*, 2015).

Infectious diseases remained leading killers, particularly among young children and adolescents, accounting for large loads of disability-adjusted life years worldwide. Although HIV infection/AIDS deaths peaked in 2006 and have since shown steady declines due to fewer new infections and increased access to antiretroviral therapy and care, HIV infection/AIDS remains a leading cause of disease burden and death, accounting for an estimated 1.5 million deaths in 2010 (Fauci AS., 2001). Tuberculosis and malaria continue to take a heavy toll, each killing nearly 1.2 million people in 2010. Microbial agents have been recognised as the cause or a contributing factor in a number of chronic diseases in addition to infectious diseases (Lederberg J., 1997). In 2008, infections were connected to nearly 2 million new cancer cases. Infectious agents are responsible for three of the top causes of cancer-related deaths: hepatocellular carcinoma produced by hepatitis B and C viruses, cervical cancer caused by human papillomavirus, and gastric cancer caused by *Helicobacter pylori* bacteria. Chlamydia pneumoniae and multiple sclerosis, Alzheimer's disease, and atherosclerosis; enteroviruses and type 1 diabetes; and rhinoviruses and pediatric asthma are among the many other potential infectious/chronic disease links being investigated. Furthermore, some genetic variables have been demonstrated to influence infectious illness susceptibility and disease progression, and hundreds more are being studied (Smolinski., 2003).

Understanding human predisposition and susceptibility to disease, microbial pathogenesis, and the creation of new diagnostics, vaccines, and therapeutics will all benefit from the sequencing of human and microbial genomes and

breakthroughs in functional genomics. Infectious illness research will become increasingly intertwined with the development of the medical infrastructure and training required in underdeveloped nations to transfer scientific breakthroughs into operational reality.

2. BACTERIAL DISEASES IN ADOLESCENCE

2.1. Tuberculosis

Each year, around 9,000 new instances of tuberculosis (TB) are diagnosed in the United States. Tuberculosis is an uncommon but infectious illness caused by the bacteria *Mycobacterium tuberculosis*. It typically affects the lungs, although it can affect other sections of the body as well (Loïc de Pontual *et al*, 2006).

Incubation Period: About 3 to 9 weeks pass after infection before the initial lesion or major tuberculin reaction appears.

Virulence and Pathogenicity: Children under the age of 12 who have TB in the lungs seldom infect others. This is due to the fact that young children have very little microorganisms in their mucus discharges. Furthermore, young coughs do not often transfer germs as efficiently as adults' coughs. Mycobacteria enter the alveoli after being breathed and proliferate in the pulmonary epithelium or macrophages (Adigun R, Singh R. Tuberculosis, 2023). Primary TB develops in an individual who has not previously come into contact with the organism. In the majority of instances (about 95%), the spread of the infection is halted, and most individuals are unaware of this first interaction (Detjen *et al*, 2015).

Symptoms: Fever, night sweats, weakness, weight loss, coughing up blood, breathlessness and chest pain are common in teenagers with tuberculosis.

Diagnosis: A positive tuberculin test may be the only indication of TB (Fig. 1). A chest X-ray may reveal the original lung nodule as well as some fibrous tissues - the characteristic Ghon complex (Fig. 2). TB can also be diagnosed by smear microscopy, mycobacterial culture, and/or polymerase chain reaction (PCR) testing (Jagannath *et al*, 2022).

Treatment: Isoniazid, given regularly for six or nine months of treatment, has been linked to a lower risk of future TB illness in any age group and has been the basis of tuberculosis infection therapy for fifty years (Gursimrat Kaur Sandhu, 2011). Three months of daily treatment involving isoniazid and rifampicin, a duration of three months of weekly isoniazid and rifampicin, a total of four months of daily rifampicin, and one month of daily isoniazid and rifampicin are newer options to the six or nine-month isoniazid regimen (Snow *et al*, 2017).

Vaccination Program and Risk of Antimicrobial Resistance in Adolescence

Abhishek Nandy^{1,*}, Humaira Saeed¹ and Aditi Singh¹

¹ Amity Institute of Biotechnology, Amity University Uttar Pradesh, Lucknow Campus, Lucknow-226028, India

Abstract: Millions of lives are saved annually thanks to vaccination, which is a success story in global health and development. More than 20 deadly illnesses are prevented by vaccines, allowing individuals of all ages to enjoy longer, healthier lives. Currently, vaccinations stop 3.5-5 million fatalities every year from illnesses including measles, diphtheria, tetanus, pertussis, and influenza. Diseases that used to often damage or kill infants, children, and adults have significantly decreased because of vaccinations. Immunization offers protection not just against the disease but also against any potentially harmful side effects or sequelae. A global danger to development and health is antimicrobial resistance (AMR). Among the top 10 worldwide public health risks to humanity as per WHO, is AMR. Drug-resistant infections are mostly brought on by the improper use and abuse of antibiotics. The proliferation of bacteria, some of which may be resistant to antibiotic therapy, is encouraged by a lack of clean water, proper sanitation, and effective infection prevention and control. The economic burden of AMR is substantial. Long-term disease not only increases the risk of mortality and incapacity but also lengthens hospital stays, necessitates the use of more expensive medications, and puts a strain on the finances of those affected. In this chapter, we discussed the vaccination programs and adolescents' risk of antimicrobial resistance as one of the major future aspects to be followed by parents of teenagers. Teenagers are the future of the world. Microbiota and diseases have an impact on their emotions, thoughts, decisions, and interactions with others and their environment.

Keywords: Antimicrobial resistance, Adolescent, Vaccination.

1. INTRODUCTION

Antibiotic resistance is a growing concern worldwide, and teenagers are not immune to this threat. The overuse and misuse of antibiotics can contribute to the development of resistant bacteria, making it harder to treat infections. Increased risk of serious infections that are difficult or impossible to treat. Longer hospital

* **Corresponding author Abhishek Nandy:** Amity Institute of Biotechnology, Amity University Uttar Pradesh, Lucknow Campus, Lucknow-226028, India; E-mail: abhisheknandy1997@gmail.com

stays, higher healthcare costs, increased risk of complications, and even death from infections are some of the risks of antibiotic resistance. Antibiotic resistance can be overcome by encouraging healthcare providers to prescribe antibiotics only when necessary. Educating teenagers about the dangers of antibiotic misuse and sharing is also necessary, along with promoting good hygiene practices to help prevent infections.

Vaccination during adolescence is crucial for protecting young people from a variety of serious diseases. The recommended vaccines for adolescents vary depending on age and individual health factors, but some common vaccines include:

- Tetanus, diphtheria, and pertussis (Tdap) booster.
- Meningococcal meningitis vaccines.
- Human papillomavirus (HPV) vaccine.
- Influenza (flu) vaccine.

The recommended vaccines for adolescents vary depending on age, health conditions, and other factors. Vaccination during adolescence is crucial for several reasons:

- **Increased susceptibility to certain diseases:** Adolescents are more susceptible to certain diseases like meningitis, HPV, and influenza due to biological changes and increased social interaction.
- **Protection from outbreaks:** Vaccines help protect adolescents from outbreaks of vaccine-preventable diseases in schools and communities.
- **Long-term health benefits:** Vaccination during adolescence can provide long-term health benefits, such as preventing cervical cancer caused by HPV.
- **Reduced healthcare costs:** Vaccinations are a cost-effective way to prevent diseases and their associated healthcare costs.

2. IMMUNIZATION PROGRAM FOR ADOLESCENTS

Most teenagers throughout the world are now protected from a variety of infectious illnesses that used to kill millions of people annually thanks to the adolescent vaccination program. In many developing countries, infectious infections that may have been avoided by vaccination cause thousands of teenage deaths each year and hospitalize thousands more. (Vaccine, KidsHealth, 2022). The basic goal of vaccines for adolescents is to increase immune status that is diminishing after the first vaccination or absence of “natural” boosting owing to exposure to the specific illness. (Rebekah Fenton, 2023). Adolescent vaccination coverage should be increased as a result of the guidelines for their vaccination. Adolescent vaccinations aid in accelerating efforts to control or eradicate illness.

Teenagers receive insufficient amounts of vaccinations because, on average, they interact with doctors less frequently than younger kids, many do not have access to healthcare, and healthcare providers frequently overlook opportunities to provide vaccines. Teenagers also participate in high-risk behaviors that raise their risk for a number of infectious illnesses, including hepatitis B and the human papillomavirus (HPV), because youth is an age for learning and experimenting. The teenage age group is the optimal target age for prevention since it is particularly susceptible to three critical illnesses (*Neisseria meningitidis*, Pertussis, and HPV), for which an effective vaccine is now available (Fig. 1). One of the greatest significant, helpful, and economical illness prevention strategies that can be offered to teenagers is vaccination. (Verma *et al*, 2015) Most teenagers throughout the world are now protected from a variety of infectious illnesses that used to kill millions of people annually, thanks to the adolescent immunization program.



Fig. (1). HPV vaccination among teenagers.

Credit: The Pharmaceutical Journal, Government advised to give HPV vaccine to boys; Online: DOI:10.1211/PJ.2018.20205207.

3. RECOMMENDED IMMUNIZATIONS FOR TEENAGERS OF 11–18 YEARS OLD

3.1. MenACWY Vaccination

The meningococcal conjugate vaccination offers protection against four strains of bacteria, identified by the letters A, C, W, and Y. At age 11 or 12, children receive their first dosage, and at age 16, they receive a booster (Immunizations for Children, CDC) (Fig. 2).

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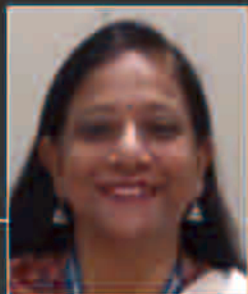
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Aditi Singh

Aditi Singh is working as professor at Amity Institute of Biotechnology, Amity University Uttar Pradesh, Lucknow Campus, India. She completed her Masters in biochemistry and doctorate with specialization in medical microbiology. She has published more than sixty research, review papers and book chapters. Her major areas of research interests are medical and environmental microbiology, antimicrobial resistance and human health.



Abhishek Nandy

Abhishek Nandy is pursuing his Ph.D. in biotechnology from Amity Institute of Biotechnology, Amity University Uttar Pradesh, Lucknow Campus, India. He is actively involved in publishing research & review papers as well as book chapters. His major areas of research interest are medical microbiology and antimicrobial resistance.