



## A Literature Review on Adolescence and Its Impact on Pubertal Changes

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Article History	Abstract
Received: 06 June 2023 Revised: 05 Sept 2023 Accepted: 11 Sept 2023	<p><b>Aim:</b> Puberty and adolescence are stages of life where within adolescence is puberty which will be characterized by a range of age and has its difference in boys and girls and begins with different changes in the body. <b>Material and method:</b> This stage of puberty is determined by the activation of certain axes and by the inhibition of some proteins that will provide the reaction of several body systems to favour the development of pubertal characters, so the objective of this study is to describe the processes involved in puberty and adolescence to improve the prognosis of time and development in the child. <b>Statistics and Result:</b> The descriptive study method was used by means of a bibliographic review of diverse scientific literature, which includes the results of research with different modalities, but all of them related to the subject and which evidences this problem. The results of the study showed that the clinical manifestations are important to know in which stage of puberty the individual is and to be able to delimit if puberty is developing in a normal way or if there is some type of delay or advancement.</p>
CC License CC-BY-NC-SA 4.0	<b>Keywords:</b> Adolescence, Organisms, Pubertal Children

### 1. Introduction

Puberty is a biological process that encompasses various aspects, such as the development of sexual organs, body growth, the development of mammary glands in girls and the development of facial hair in boys, among other physical and hormonal changes these changes are driven by the activation of hormonal axes and the production of sex hormones, such as estrogen in girls and testosterone in boys.

On the other hand, adolescence is a broader and more complex stage that encompasses not only the physical changes of puberty, but also cognitive, emotional and social changes, during adolescence individuals experience a reorganization of their identity, the exploration of their autonomy, the development of abstract thinking and the consolidation of interpersonal relationships (Vazquez et al., 2022; Estupiñán et al., 2021).

It is important to recognize the distinction between puberty and adolescence, as puberty refers specifically to biological and hormonal changes, while adolescence is a broader period encompassing multiple aspects of development.

This distinction allows us to understand the complexity and diversity of the changes that occur during adolescence and recognize the importance of addressing not only physical, but also psychological and

social aspects in the support and accompaniment of adolescents at this crucial stage of their lives (Güemes et al., 2017).

The term adolescence comes from the Latin word "adolescere", from the verb to suffer which means: To have a certain defect and also growth, development and maturation, which includes the fundamental physical and emotional changes, which create the characteristics of adult life. This is where puberty begins, which will lead to the transformation of the child into an adult (Arias et al., 2020).

Adolescence is the stage of life that extends over a long period of time, although there are different criteria regarding age, the WHO considers the period between 10 and 20 years (Ricardo & Silva, 2019). Puberty has its origin in puberty, which means suitable for reproduction, it is a biological change in which the secondary sexual characteristics of an individual develop with the complete maturation of the gonads and adrenal glands, as well as obtaining the peak of bone, fat and muscle mass and the final size of an adult is achieved. This is in the stage of adolescence where a process called puberty occurs where there are biological psychological emotional changes and that develop in indistinctly distinguished mind in men and women comes then that puberty in women is related to the appearance of thelarche between 8-13 years and men begins by the increase in testicular size between 9-14 years in boys (Ricardo & Silva, 2019).

Puberty commonly lasts 3-4 years, with each Tanner stage maintaining about 12-15 months. The normal limits of puberty onset (T2) are maintained between 9 and 11 years in white European girls (mean 10.7 years) and the end of puberty at 15.2 years.

Precocious puberty. A very common reason for pediatric consultation is in relation to secondary sex characteristics. Puberty is considered early or early when pubertal changes begin before age 8 in girls and age 9 in boys. Puberty is considered precocious if it appears before age 6 in black girls and before age 7 in others. Precocious puberty is commonly central (CPP), dependent on gonadotropins (Bouvattier, 2017). Pubertal delay is defined by the absence of maturation of secondary sexual characteristics at an age that is +2 or +2.5 SD (standard deviations) later than the average of a population. Clinically, it is best to evaluate girls who do not have breast development at age 13. This is a condition, by definition, for 2.5% of girls (Luisa et al., 2022).

Pubertal delay is much less common in girls than in boys. It is often psychologically poorly tolerated, and girls seek consultations because of an absence of secondary sexual characteristics and short stature, in the absence of acceleration of growth velocity normally associated with puberty (Arias et al., 2020; Cano et al., 2020; Herrera et al., 2020; Del et al., 2020). The problem for the doctor is to distinguish patients with permanent gonotropic deficit and ovarian insufficiency, who will need treatment to obtain a complete pubertal development, from girls who have a pubertal delay called simple, which will be corrected spontaneously (Pillajo et al., 2020; Piloso et al., 2020; Rodríguez et al., 2020; Bouvattier, 2017).

### **Growth and development retardation = late ripener**

Short stature

No endocrine disorders

No congenital anomaly

No pathological causes to explain this delay

And the vast majority are accompanied by features such as:

Growth retardation

Pubertal delay

Age/Height less than 2 to 3 years with respect to the chronological age.

Bone age less than chronological age; but matches Age/Size

These young men have full puberty, but reach it two to three years later than corresponds to their chronological age.

Most reach a normal adulthood (Bouvattier, 2017).

### **Physiological variants of puberty**

There are other situations that are not pathological processes, isolated events at an unexpected time, as a result of temporary imbalance of the endocrine mechanism and a constitutional deficiency in the pattern of development, which eventually ends in normal puberty (Capera et al., 2019).

Small breasts

Virgin breast hyperplasia

Asymmetrical breasts

Primary and secondary amenorrhea

Gynecomastia

Growth retardation

and late development or ripener

### **Control mechanisms responsible for the onset of puberty**

The mechanisms that allow puberty to begin are poorly known, but it is known that they rest on the AXES

Cortex - hypothalamus - pituitary - gonadal (C - H - H - G)

Cortex - hypothalamus - pituitary - adrenal (C - H - H - A).

### **Mechanisms to explain the onset of puberty**

#### **Leptin,**

It is a hormone produced by adipose tissue, which has a regulating function of appetite and energy production; It is released when we eat food.

It is proposed that it is related to the triggering of puberty in the male, initiates puberty, but does not maintain it, being increased in stages II and III, decreases again in IV and V (Güemes et al., 2017).

#### **Adipose**

Gonadosat (Site where gonadotropin is produced)

Pubertal development has a lot to do with genetic-family background, socioeconomic level, geographical location, among others, but it is logical to assume that these are mediated by a common factor, related to a natural biological clock, capable of perceiving the passage of time and deciding the moment in which a stimulating effect of the gonadosat is triggered for the onset of puberty. A metabolic indicator informs that a certain stage of maturity (growth and development) has been reached, which allows the pubertal phase to begin.

Puberty begins with a decrease in the sensitivity of the gonastat, which allows increased secretion of GnRH, which becomes pulsatile. GnRH acts on the pituitary gland by increasing the secretion of FSH and LH, which in turn stimulate the corresponding gonad with increased production of androgens and estrogens.

Being the gonadosat between 6 to 15 times more sensitive than in adulthood

#### **The kiss**

As mentioned on several occasions, puberty begins with a kiss, and from there the theory has its name.

KISS is considered the predominant stimulatory element in the activity of GnRH-producing neurons. Kiss is a gene that triggers puberty.

Kisspeptin is a protein expressed by a gene called kiss-1, which in the pubertal stage sends a signal to a receptor (gene called GPR54) that is the activator of the production and release of hormones responsible for sexual maturity (De la Rosa, 2018).

The action of kisspeptins is key in the hypothalamic-pituitary-gonadal axis, as one more link in this chain activating the secretion of GnRH to initiate puberty and maintain reproductive function in adulthood

KISS synthesizing neurons are the main structures that serve as intermediaries between signals of somatic and environmental origin that modulate the functions of GnRH-producing neurons, determining both tonic release and phasic secretion of pituitary gonadotropins.

### **Axle activation**

Puberty begins with activation of the hypothalamus, which secretes luteinizing hormone-releasing hormone (LHRH), also known as gonadotropin-releasing hormone (GnRH), pulsatile. This peak of LHRH secretion leads to activation of the anterior pituitary with the secretion of gonadotropins: luteinizing hormone (LH) and follicle-stimulating hormone (FSH) (Moniez et al., 2022).

These gonadotropins will activate the gonads: testes and ovaries (Fig. 1).

In the girl, these gonadotropins stimulate the secretion of estradiol, which is responsible for the development of the breasts and the maturation of the internal genitalia (ovaries and uterus).

In males, LH activates the secretion of testosterone related to Leydig cells in the testes. Testosterone causes the appearance of secondary sexual characteristics such as increased penis size,

hairiness, increased muscle mass, change of voice. FSH is responsible for the maturation of Sertoli cells, essential for spermatogenesis, which is clinically manifested by an increase in testicular volume.

### **Activation of the hha axis**

The activation of this axis produces adrenarche.

It is proposed that a hormone that has not yet been isolated, acts on the adrenal producing androgens, responsible for sexual hair.

Once GNRH acts and exerts its action on two different pituitary cells, one that produces FSH and the other LH, they stimulate the gonads to produce sex steroids; which in turn exercise a function of retro control (3)

### **Somatic changes**

During puberty important somatic changes occur, particularly in height, weight, body proportions, relationships between adipose tissues, muscle and body water content; in bone mineralization, and in the functional conditions of the heart, blood pressure, lungs, liver, brain and kidney (Calzada, 2019).

Body modifications, especially in secondary sex characteristics, depend on functional changes of the adrenal glands and gonads. The intensity of pubertal manifestations depends on the body's ability to respond to these hormonal changes, and many of them present differences between the Latin American population and those described for Europeans.

Activated HHG axis begins a wide production of steroid sexes (estrogen and testosterone) that lead to somatic changes according to sex.

The girl begins her puberty at approximately 9 years, begins with the appearance of the breast button and slight widening of the hips, then pubic hair appears.

In the III stage of breast development menarche occurs (13.5) and it is at this time, that together with the growth spurt of puberty, juvenile acne and increased adipose tissue appear.

The male begins his development at age 11. Increased tests (ET II) and little pubic hair, which a year later gain in quantity and thickness.

The penis remains undeveloped until stage III which increases in length and in IV in thickness and the glans appears. Axillary hair appears, some hairs at the end of the upper lip (bozo), there is thickening of the larynx with characteristic voice changes ("roosters").

The pubertal growth spurt occurs that is greater than that of the female and a little later (ET IV and V). Nocturnal ejaculations (pollution) may occur.

When these changes become evident, before eight years in the female and ten years in the male, we speak of PRECOCITY.

When they have not made their appearance at 13.5 - 14 years in boys and girls over 13 years of age, delayed puberty is thought (Calzada, 2019).

## **2. Materials And Methods**

A review was made for Descriptive research on the changes in adolescence and puberty of different articles and scientific reviews such as: Pubmed, Scielo, Google academic Biomed central, Med int mex,

We included 27 publications in English and Spanish, from any country published between 2018 and 2022, consisting of books, reviews, articles that took into account the following variables: authors, journals, years, titles and objectives of the publications. For the search were used as descriptors such as "normal puberty", "delayed puberty", "physiological regulation of puberty", "somatic changes in puberty".

Of a total of 63 articles initially selected, 36 of these were discarded, for presenting outdated information, which is why they did not offer renewing information, according to established standards, in addition some of these were not synchronized with the object of study.

## **3. Results and Discussion**

While the categories of adolescence and puberty are often treated as one, the existence of two distinct terms points to different types of maturation in humans. Puberty refers to a period of coordinated somatic growth and reproductive maturation that shifts individuals from non-reproductive youth to reproductive maturity.

Adolescence includes the behavioural and social assumption of adult roles. Life history theory offers powerful tools for understanding why puberty occurs later in humans than in other primates, including the benefits of late reproduction as part of a cooperative intensive life history strategy. It also sheds light on the ways in which the timing of puberty responds to environmental variation (Reiches, 2019).

Puberty and adolescence mark the metamorphosis of the child into the adult, which is why biologists have typically viewed puberty from an endocrine standpoint, a perspective that considers the overt signs of reproductive maturation driven by hormonal changes that occur during this developmental period (Sisk & Foster, 2004).

Over the past four decades, there has been a deeper understanding of neural control of hormone secretion and a gradual awareness of brain remodelling during adolescence, opening up the emphasis on a neural basis for reproductive maturation. Neuroscientists want to answer two main questions about puberty: how is it timed and what are the underlying neural mechanisms?

### **Sex differences at the time of puberty**

Males and females often start and end puberty at different times, and the magnitude and pace of these differences depend on the species. Order is too. For example, girls show outward signs of puberty earlier than boys (Pham et al., 2022), but male lambs begin puberty earlier than female lambs. Little is known about the mechanisms of these time differences, but whatever they are, they must originate within the brain, given their essential role in regulating GnRH secretion. Most likely, these mechanisms are both genetic and programmed, really a pure genetic mechanism (Crockett & Petesen, 2021).

The basis is difficult to assess because neurons are bathed in a variety of substances during development. We are beginning to appreciate how the timing of puberty can be prenatally timed by sex steroids. For example, studies in sheep reveal that prenatal administration of testosterone to developing women will advance the time of pubertal GnRH increases by several months (Van et al., 2021).

This review defines the terms adolescence and puberty and from which words these terms are derived in turn that their difference lies in that puberty is within adolescence as the somatic changes that occur in the human body formed by part of the appearance of both male and female sexual characteristics. Puberty can be said to last between 3 and 4 years and each tanner stage is set to last about 12 to 15 months until the maturation of final secondary sexual characteristics.

The early maturation of secondary sexual characteristics are the most frequent cause of pediatric consultation and in this we can see that secondary sexual characteristics develop well before the established age to consider that there is a late puberty we have to take into account that this is the one that develops at 8 years in girls and at 9 years in boys the delay in maturation of the secondary sexual characteristics where parents see that their children do not have an adequate development or that they have very little developed their pubertal characters such as the lack of breast growth in women or the non-descent of the testicles in men that happens more or less two years or two and a half years after the general population this is much more common in boys who in girls (Prashar et al., 2022)).

The delay of maturation is also considered with the name of late ripener, many times the normal physiological variants of puberty are confused with puberty delay by the characteristic that they resemble in their clinical manifestations and that they are similar the importance of the maturation of the secondary sexual characteristics begins with the activation of the hypothalamus pituitary axes both gonadal and adrenal that are those that produce hormones that are those that develop normal pubertal characters in turn have the support of leptin which is a hormone that is related to the onset of puberty and that originates from adipose tissue that will also be related to the gonadosat that at puberty will begin with its decrease so that it allows the increase of GnRH secretion.

Kiss is a protein that will help pubertal development, this is considered as an element that will act as a stimulator of the activity of the hormones of the neurons that produce GnRH.

All this will help the somatic changes that will be related to biology, physique and emotions that the individual experiences in these 3 or 4 years that have puberty depend on functional changes of the adrenal glands and gonads (Reding et al., 2021).

#### 4. Conclusion

In conclusion, it can be said that puberty and adolescence are crucial stages in human development, where various physical and hormonal changes occur that culminate in the development of secondary sexual characteristics. These changes are mediated by hormonal axes and proteins that trigger a series of transformations in the body. It is essential to take into account the clinical manifestations during this stage to understand what phase of puberty an individual is in and to be able to assess whether their development is occurring properly. Identifying the characteristic signs and symptoms of puberty provides valuable information to determine if there is any delay or advancement in the process of sexual maturation. Monitoring of clinical manifestations can help healthcare professionals detect possible alterations in pubertal development, facilitating early identification of hormonal or endocrine problems. This allows adequate medical care to be provided and the necessary measures to be taken to intervene, if necessary, thus optimizing the health and well-being of adolescents.

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## A Literature Review on Adolescence and Its Impact on Pubertal Changes

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