



Adolescence, Multidisciplinary Team and Pubertal Stages

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Introduction

Adolescence is a period of life with specific health, social and psychological needs. Puberty is the series of physical and physiological changes that occur in adolescence and lead to sexual maturity. Adolescence begins with the biological phenomenon of puberty and extends beyond it [1]. The individual has no control over the bodily transformations that are beginning. All these transformations drive changes in the psychic plane and conflicts arise. The adolescent, at this stage, has the task of synthesizing childhood experience into adulthood [2].

The Adolescent Medicine Division is part of the Pediatric Department at Universidade Federal de São Paulo and provides medical services for adolescents between the ages of 10-19 years. Using a multidisciplinary approach, the division serves also as a center for studies in adolescence, responding to adolescents' health, psychosocial and social needs, with the aim of preventing or minimizing problems. To accomplish these goals, the division relies on a holistic approach using systematic assistance in health care, nutrition, psychology, pedagogy, dentistry, etc. Adolescents are evaluated for Tanner stages by our division's physicians and these data are available to all other professionals involved in their care.

Chronological age is largely used to limit adolescent care. However, this period of life involves a more complex series of biological and psychological transitions. In order to better understand the development of individuals in this age group, the identification of the pubertal stage is imperative, both for development of preventive and health care programs, as well as for the design of studies in this area. One of the reasons for this is that different parts of the adolescent brain mature at different speeds. While puberty drives most adolescents toward risky behaviors, the slow maturation of the cognitive-control system, which regulates these impulses, makes adolescence a period of increased vulnerability. This explains why educational interventions designed to change adolescents' knowledge, beliefs, or attitudes have been ineffective [3]. In addition, both early-maturing girls and boys should be regarded as high-risk populations for substance abuse, and intervention programs may be more effective

if they are targeted accordingly [4]. Furthermore, girls who mature early are at risk of shorter sleep duration in adolescence [5]. Therefore, in order to achieve greater success in preventive programs for adolescents, the issue of pubertal stages and timing should be taken into account.

The sequence of events observed during puberty were described by Marshall and Tanner in the early 1960s. Sexual maturation is assessed through the pubertal staging that classifies pubertal development into 5 stages for breast (B1-B5), genital (G1-G5) and pubic hair growth (PH1-PH5) [6]. In our division, the so-called Tanner stages are used not only by medical professionals, but also by others engaged in adolescent care, namely nutritionists, psychologists, dentists and social workers. In our division, we also use another classification according to Tanner gonadal stages: before growth spurt (G1, G2, B1), during growth spurt (G3, G4, B2, B3, B4), and after growth spurt (B5 and G5) [7, 8, 9]. The purpose of this short communication is to describe the experience from the Adolescent Division of Medicine, Universidade Federal de São Paulo, using the Tanner stages as the basis for planning the delivery of health care to the adolescent population.

A review of first medical appointments in our division from 2007 to 2016 identified 211 12-year-old adolescents (110 males). Amongst them, 10.9% were in G1; 34.5% in G2; 36.4% in G3; 12.7% in G4 and 5.5% in G5. Among the girls, there were none in B1; 8.9% were in B2; 16.8% in B3; 39.6% in B4; and 34.7% in B5. Increased conflict between parents and children is reported at the onset of puberty and may occur at different chronological ages. Levels of certain pubertal hormones have been correlated with individual differences in the intensity of conflicts [10].

Adolescents entering puberty later report fewer problems than those who enter puberty earlier. The latter report feelings of loneliness and inadequacy [11, 12]. These behaviors are explained as a combination of disorders related to the hormones of puberty with a relatively immature brain. According to Goddings et al. [13] increased hormone levels (independent of age) were associated with higher left anterior temporal cortex (ATC) activity during social emotion processing. More advanced age (independent of hormone levels) was associated with lower dorsomedial prefrontal cortex (DMPFC) activity during social emotion processing. This suggests functionally dissociable effects of pubertal hormones and age on the adolescent social brain.

Data from the division show that there are specific implications in the various health conditions, depending on the stage of pubertal development, and therefore, care should be tailored to each stage. A

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study evaluating 269 adolescents attending the clinic showed that females after the growth spurt present a 3.7 higher chance of having gum disease when compared to female patients before the growth spurt [7] and this information should be taken into account in oral health prevention programs. Temporomandibular dysfunction (TMD) was studied in different Tanner stages, but no relationship was found between this disorder and pubertal stages, probably because TMD is a complex and multifactorial dysfunction [8, 9].

Pubertal development also impacts education and school attendance. Among the patients evaluated by this division, the 202 adolescents who were attending 7th grade varied greatly in relation to their Tanner stages; 3.7% were in B2; 19.1% in B3; 32.7% in B4; and 44.5% in B5. Regarding boys, 4.3% were in G1; 20.7% in G2; 35.9% in G3; 25% in G4; and 14.13% in G5. Schools need to be prepared to receive students at different levels of development. Other authors have analyzed the impact of dysmenorrhea on adolescent life, showing the consequences of pain or other symptoms (headache, nausea) in school attendance [14]. Pitangui et al. [15] showed that 31% of girls missed school when they were menstruating.

Visual and motor coordination is an important component in psychodiagnosis and is associated with cognitive functions and psychoneurological aspects. In adolescence, changes related to puberty generate non-linear anthropometric development resulting in mild and temporary incoordination. In a study involving 134 adolescents of both sexes between the ages of 10 to 15 years, Kepeke et al. [16] showed an association between visual development and sexual maturation in male adolescents, with inferior results in stage G3 (adolescence spurt). This issue should be taken into account when delivering effective pedagogical supervision.

When selecting athletes to enter sports in schools, coaches and physical education teachers take into account Tanner stages to know if the adolescent will still grow in height and develop muscular strength [17]. One study by Juzwiak et al. [18] involving 44 adolescent tennis players identified 24% of younger athletes (10 to 13 years) in G1 or G2, while the majority of older athletes (14-18 years) were in the G4 (52%) or G5 (44%) stages.

Adequate nutrition is of great importance during adolescence, a period in which there is remarkable growth with increased demand for energy and nutrients. In our division, individual guidelines emphasize the changes that occur throughout the treatment because of the different needs of each pubertal stage, and patients are well aware of the adjustments needed at each stage. The adolescent reaches approximately 25% of his/her final height and 50% of his/her body mass during adolescence [19]. A higher metabolic risk of visceral fat in obese and overweight adolescents is associated with pubertal stage [20]. The sexual dimorphism in leptin concentration and adiposity between girls and boys during puberty exemplifies the complex orchestration between metabolic demands and the effects of hormonal changes. Leptin increases in the later stages of puberty among girls [21].

Nutrition is a key component to achieving full growth potential. It is therefore mandatory to consider the Tanner stage when evaluating the nutritional status of adolescents. Pediatricians or other specialists have historically been the primary care providers for adolescents. Adolescence is a period of life with very specific characteristics and should regard as a unique period of development requiring a more holistic approach. This population needs to be cared for by different professionals so that the full extent of biopsychosocial modifications linked to pubertal changes can be assimilated. Professionals from different areas of health and education benefit by integrating their

specific knowledge to the study of pubertal development.

The experience of this division in providing care to adolescents supports the characterization of patients based on their pubertal development rather than exclusively on chronological age. The fact that studies identify important modifications in the emotional, physical, psychological or social aspects in the different pubertal stages [3, 4, 5, 7, 10-13, 16-18, 20, 21] reinforce the thesis that the multidisciplinary care to the adolescent should be based on the pubertal stage, rather than on the chronological age. That is, in the same age group, there is variability in the pubertal development of adolescents and, as a consequence, different strategies and prevention programs are established.

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