

# Premature adulthood in boys: persistent exposure to high energy food, adult societies and sexualized media

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**Abstract**— Puberty is a temporal and a sequential process. The pubertal stage today's still persisting but its timing is changed due to changes in nutrition, body weight, social stress, and exposure to adult societies. The objectives of this study were to investigate the effects of persistent exposure to adult societies, media, cattle rearing and meat in male children for pubertal timing. Five groups were made, each group contained 20 children. All children were examined by a physicians and morning serum total testosterone were measured in their blood by using Bio-check (USA) kit. Total serum testosterone was significantly ( $P^{****} < 0.0001$ ) higher in butcher children ( $102.3 \pm 21.15$  ng/dL), workshop children ( $98.20 \pm 23.53$  ng/dL), media exposed children ( $101.9 \pm 18.38$  ng/dL) and shepherd children ( $90.70 \pm 13.64$  ng/dL) as compared to age matched control group ( $45.10 \pm 9.25$  ng/dL). It is concluded that persistent exposure of children to adult societies, Medias, cattles and eating meat for a long time positively affects pubertal timing, propelling the children to premature adulthood abruptly as compared to age matched control group.

**Index terms**- Puberty, Temporal, and Testosterone

## 1 INTRODUCTION

Puberty in physiology is defined as, the appearance of secondary sex characters. In boy the first manifestation sign of normal puberty is pubic hairs and testicular enlargement, which increases from 1-3mL before puberty up to 15-25 mL in adulthood [1], [2]. In endocrinology an increase release of GnRH (Gonadotropin Releasing Hormone) from the hypothalamus leads to puberty onset [3] because at puberty, release of increase pulsatile GnRH causes secretion of the LH (Leutinizing Hormone) and FSH (Follicle Stimulating Hormone). These LH and FSH then elevate the level of testosterone hormone, which in combination with FSH starts spermatogenesis [4].

(both male and female) and guinea pigs (female) can be induced by pulsatile infusion of GnRH.

Precocious puberty can be defined as the earlier production of sex hormones or exposure than the norms for gender and racial or ethnic background [7]. On the basis of etiologies, there are two types of precocious puberty i.e. Central Precocious Puberty (CCP) and Peripheral Precocious Puberty (PPP). A variety of Central Nervous System (CNS) abnormalities like CNS trauma, CNS infections, CNS irradiation, hydrocephalus, brain tumor and gain of function mutation of kisspeptin/ kisspeptin receptor activate the hypothalamic-pituitary-gonadal axis and ultimately result CPP. Genetic, environmental factors and increased adiposity in adopted children after nutritional deprivation also causes CPP. PPP in boys are caused by the primary hypothyroidism, congenital adrenal hyperplasia, exogenous testosterone exposure, Leydig cell tumor, hCG-secreting tumor, androgen-secreting adrenal tumor etc. [8], [9].

Sex, nutrition and environment, affects the timing of sexual maturation [10]. The incidence of precocious puberty is higher in girls as compared to boys i.e. 15–20 females for each male with the disorder because, of having a hypothetical greater number of kisspeptin fibers [11], [12], [13]. Precocious puberty is positively correlated with obesity [14]. In all ethnicities, rates of

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This has been confirmed by Wildt *et al.*, 1980 [5]; Loose and Terasawa, 1985 [3] and Plant, 2001[6] that precocious puberty in sexually immature monkeys

obesity are significantly higher in boys as compared to girls of pubertal age [15]. Ethnicity as compared to obesity has a significantly higher contribution in precocious puberty [15], [16], [17], [18], [19]. Leptin produced by fat has a role in the onset of puberty because; it is known that leptin-deficient *ob/ob* mice have arrested puberty and infertility [20], [21].

Endocrine disruptors, psychosocial stress, and early exposure to an increasingly sexualized society also triggers early onset of sexual maturation. Sexual exposure is more provocative but, not well supported in the literature. It is thought that, early exposure to sexual images in real life or *via* media stimulates the complex neuroendocrine pathways that results in puberty [22]. Similarly, excessive music excites the whole nervous system significantly and especially to the imagination that, then leads to the premature awakening of sex drive [23]. Young children adopted dress style and have also idolized pop-singers and rocks portrayed on television. These songs contains adult sexual theme and, for wanting to be cool are memorized by the children. Through these songs with sexual seductive words, one can observe the media's duplicity in hurrying and exploiting preteen children into adulthood [24]. It was estimated that 45% of the world population would be less than 24 years of age by the year 2000. This results because, of the exposure of children to an adult societal context and culture that propel the children towards adult dress, recreation and adult activities [25].

In order to more fully understand about pubertal timing in boys, the present study is designed to find out the effects of rich protein diet, adult society, cattle rearing and media (television, Internet, mobile phone etc.) exposure in early childhood. For this purpose the children of butchers, shepherds, workshop children and media exposed children were recruited in the study.

## 2 Materials and Methods

### Consent

A written informed consent was signed from all the participants fathers/guardians, before starting study. Suitable to the age, enough information were also given to the children about the study. All the children enter the study voluntarily. Permission from the local

community leader as well as register medical practitioner (Medical specialist) was also obtained for this study.

### Study area

This study was carried out in district Dir (lower), Khyber Pakhtunkhwa, Pakistan.

### Ethnicity

The children recruited were Pakistani Pathan

### Study Design

Five groups were made for the present study. (1) Control group (2) shepherd children (3) Butcher children (4) workshop children and (5) Media exposed children. Each group contained 20 male children. Their age ranged from 8 to 10 years. Control group children had a normal diet, had no access to media but had access to normal recreational activities. Shepherd children spent most of their time with goats and sheep. These children saw the animals mating with one another and heard their mating sound. They were also trained how to mate the goats and sheep successfully. These children were not school going. Butcher children were supplied with abundant of meat in their diet but had no access to media. Workshops childrens, spent most of their time in markets, selling ladies garments (including breasers, nighty dresses, under wears cosmetics etc.). They were also exposed to the talk of ladies, talking with one another and also with market children about the size and quality of breasers, under wears and varied numbers of cosmetics for special purposes. The last group was exposed to media like mobile phone, internet, TV etc. but their diet was normal.

### Physical examination

Physical examinations such as, axillary hairs, pubic hairs and scrotal changes were performed in clinic by a medical specialist to evaluate specific Tanner stage.

### Blood sampling

Morning blood samples of 5 mL size were collected aseptically from the cephalic vein of all children by a phlebotomist in a stress proof clinical laboratory. Blood were immediately transferred into glass Vacutainer tubes (Becton Dickinson) without anticoagulant or preservative. These blood samples were then transported on dry ice to another laboratory, where the samples were centrifugated at 3000 rpm for 15 minutes at 4 °C. The resulting serums were stored at -20 °C for latter analysis.

### Assay

Bio check (USA) kit was used according to the manufacturer instructions and protocol for measuring total serum testosterone concentration.

**Exclusion criteria**

Children with chronic physical and mental problems were excluded from the study. Participants were not taking known medications (including hormonal) that affect reproductive axis.

**Statistical analysis**

For data analysis, software Graph Pad Prism, *version 6.03* (Graph Pad Software Inc., San Diego, CA, USA) was used. All the four groups were compared with control group by using un-paired t- test. The results were represented as Mean± SD. A significant difference was acknowledged at  $P < 0.05$

**3 Results**

The various characteristics of study population are summarized in Table 1.

Table 1: characteristics of study population

Groups	Normal	Shepherd's	Butcher's	Workshop's	Media exposed
Age (years)	9.07±0.54	9.05± 0.63	8.96±0.64	8.67± 2.02	8.93± 0.6
Weight (Kg)	27.92±2.53	28.16±1.71	33.63±2.08	28.44±1.56	29.93± 1.99
Tanner stages (I- V)	All Tanner II	15Tanner II 5 Tanner III	9 Tanner II 11 Tanner III	12 Tanner II 8 Tanner III	11 Tanner II 9 Tanner III
Economic status	Poor	Poor	poor	poor	middle
Schooling	Yes	Not	yes	not	yes

**Total serum testosterone concentration in study population**

The results of study population are summarized in Table 2. The results showed that meat, cattle rearing, media and adult society exposure in children significantly ( $P^{***} < 0.0001$ ) increases serum total testosterone level at 95% confidence interval as compared to age matched control group.

Table 2: Total serum testosterone concentration in study population

Groups	Parameter	Mean±SD (ng/dL)	Confidence Interval	Probability
Control	Total serum Testosterone	45.10±9.25		
Shepherd's		90.70±13.64	-38.14 to -53.06	<0.0001
Butcher's		102.3±21.15	46.70 to 67.60	<0.0001
Workshop's		98.20±23.53	41.66 to 64.54	<0.0001
Media exposed		101.9±18.38	47.43 to 66.07	<0.0001

#### 4 Discussion

In the present study we investigated the effects of protein diet, media exposure, adult society exposure and cattle rearing in children, to explore whether it induce puberty earlier than the normal timing. We found that all these factors cause early puberty when compared with age matched control group.

Puberty is a very complicated process that is triggered by multiple and very complex neuro-endocrine pathways, ultimately leading to the achievement of primary and secondary sex characters. Puberty does not occur abruptly but, is subdivided into five stages called Tanner stages (I-V). It is a temporal process and occurs in sequential manner [26].

Kisspeptin one of the most important hormone is a key regulator of puberty. This is supported by the evidence that deletion in kisspeptin or kisspeptin receptor gene can cause delay puberty [27] or precocious puberty in humans [28]. Similar findings are reported in other animal models [29]. Kisspeptin is a very potent GnRH secretagogue, causing the secretion of GnRH into the median eminence that acts on gonadotropins in pituitary gland causing the secretion of LH and FSH. These gonadotropin hormones have a role in gametogenesis and steroidogenesis. During infancy, the ARC kisspeptin pulsatility is robust, and so is GnRH and gonadotropins. But during the transition from infancy to juvenile phase, a neurobiological brake suppresses the pulsatility of kisspeptin and so GnRH and gonadotropins, leading to a hypo gonadotropic state. During pubertal onset, this neurobiological brake is removed, and the robust pulsatility of kisspeptin and GnRH is restored. Two substrates such as, gamma amino butyric acid (GABA) and NPY is reported for this neuro

Biological brake, but what regulate these is still unknown, thus what exactly triggers puberty is still a Mystery [30]. For pubertal development, attainment of certain percentage of body fats is very crucial. Both fats and leptin concentrations are directly correlated [31]. Leptin is secreted by white adipose tissues and at the hypothalamic level acts as thermo genic and anorexigenic factor [32] providing permissive signals for puberty onset and fertility [33]. Leptin control the expression of kisspeptin neurons, as leptin receptors are present on kisspeptin neurons. In the ARC nucleus, decreased expression of kisspeptin level was found in leptin deficient ob/ob mice. This decreased level was restored by administration of leptin [34]. Diabetic rat models which are hypoleptinemic, leptin administration normalize hypothalamic kisspeptin expression [35]. In patients with leptin mutation have hypogonadotropic hypogonadism and are unable to enter puberty. These conditions are reversed by leptin therapy [36]. All these results strongly agree with our findings (butcher children).

Exposure of children to adult culture and societal context propels them towards adult dress, recreations and other activities. These adult societal environments hurry pubertal maturation leading them to sexual abuse, violence, aggression and anxiety [25]. Preteen children, two to three decades ago were not allowed for makeup and stockings but, today they uses skirts, hip hugger jeans, spandex pants, halter tops, bikini swimsuits, sunglasses and designed jeans and shoes [25]. These children using adult stuff would act like mini adults [37]. Most of the children have idolized pop singers and hip hop. Their songs are of adult sexual theme and for wanting to be cool; painstakingly these seductive words are memorized propelling children to adulthood [24]. Excessive music leads to premature sexualisation and menstruation by over stimulating the body. Music causes ovulation by enhancing the development of graffian follicles. It also acts as a stimulant in the genital sense and is therefore one of the most important cause of relative precocity of puberty [38], [39]. Excessive music also excites imaginations and the whole nervous system significantly, leading to premature menstruation and sex drive [23]. Most of



the children have a decreased time for recreational purposes. Their summer vacations instead of recreations are replaced by dance, computer and language classes. Some children care for themselves at empty home while others have a very young, unemployed and mostly single parent [37], [40]. Children having decrease access to healthful food, physical activities and persistent exposure to chronic and acute stress triggers pubertal onset [41]. Recreational activities such as basketball, tennis court, parks and walking or hiking trails slows pubertal onset [42]. Music videos and images portrayed on television triggers early occurrence of sexual behaviors [43]. In children psychosocial stresses including sexual abuse, acts as a stressor and activate puberty onset [44]. Similarly in young girls exposure to an unrelated adult male including step-father causes early pubertal maturation *via* pheromones [45]. All these findings support our results.

## 5 Conclusions

In this study we found that children exposed to adult societies, sexualized media and environment, hurry pubertal timing and stimulate premature sex drive. Similarly children exposed to rich diet evoke sufficient adiposity abruptly, that is crucial for pubertal initiation. Premature adulthood has social, physical and psychological implications. Children with early sexual development face remarkable social stigma and so tremendous ill effects on their health and wellbeing. These children should be identified in the societies and special care, educations and guidelines should be given to them about their premature sexual development. Further studies are needed to investigate the exact molecular pathways, of how these societies and environment affects pubertal timing and how premature adulthood should be prevented.

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