Does Handedness and Altitude Affect Age at Menarche?

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Summary

Although there is knowledge about earlier mean age at menopause among left-handed postmenopausal women, it is unclear from the literature whether age of menarche is influenced by the prenatal hormonal pattern and cerebral lateralization. We therefore planned to investigate the relation between age of menarche and cerebral lateralization in girls at an altitude of nearly 2000 m. Sixty-two girls, aged between 9.4 and 15.5 years, were interviewed by questionnaire about manual dominance and menarcheal age. All girls were divided into two groups: left-handers (n = 31) and right-handers (n = 31). It was shown that there was a significantly lower average age of menarcheal appearance (12.96 ± 1.34 years) in the left-handers’ compared with the right-handers’ (13.72 ± 1.41 years; p = 0.025). The earliest menarcheal age was 9.4 years in left-handers and 10.1 years in right-handers. A menarcheal age of 13.34 ± 1.35 years was found for the whole group at an altitude of nearly 2000 m. This data leads us to believe the existence of a link between functional brain asymmetry and menarche. It would appear that the activation of the hypothalamic–pituitary–gonadal axis is earlier in left-handed females than in right-handed females.

Introduction

The intrauterine environment has recently attracted the interest of investigators in two different research fields: the physiology of brain lateralization and the etiopathogenesis of ovarian germ cell tumors, testicular and breast cancer.1,2 The origins of brain functional and anatomical asymmetries and their relations to human lateralized behaviors represent an important research area in neurological and behavioral sciences.1,3 It has also been suggested that patterns of cerebral lateralization may be associated with particular characteristics of the immune and endocrine systems.1 Handedness represents one of the most evident ‘indicators’ of cerebral lateralization.1,4 Some attention has been paid to the possible association between handedness and early natural menopause.5,6

We know that the age of onset of puberty in normal children is mainly determined by genetic factors when socioeconomic and environmental factors lead to optimal nutrition, general health and infant care.7 Leidy5 found an earlier mean age at menopause among left-handed postmenopausal women. However, the literature does not give a clear relation between age at menarche influenced by the prenatal hormonal pattern and cerebral lateralization. We therefore planned to investigate this relation in girls at an altitude over 2000 m.

Materials and Methods

The study was carried out on girls who have menarche. In the first part of the study, survey forms were given to the girls to evaluate the age of menarche, menstrual cycle, socioeconomic and sociocultural positions, and health status. The appearance of the first menarche was accepted the age of menarche, and was used as a natural model of functioning of the hypothalamic–pituitary–gonadal axis. Chronological age was determined to the decimal age.8 Girls were evaluated by the Oldfield (Edinburgh Handedness Inventory) Index9 to determine their handedness status. The girls were divided into two equal groups according to being left- or right-handed. Equal numbers of left-handed and right-handed girls were taken in order to be able to make a reliable comparison between the groups. Thus, the first group comprised 31 left-handed girls and the second group comprised 31 right-handed girls from the same region.

Certain criteria were considered in order to let the hand skills of the individuals included in the study become more apparent. Those individuals with any systemic and chronic disorders and those with a physical disease limiting their body motions were not included in the study.

The girls and their families were informed about the purpose and the method of the study, and they all agreed to participate.
Results

The socioeconomic and socio-cultural positions of the two groups (left- and right-handers) were similar. It was shown that there was a significantly lower average age of menarcheal appearance in the left-handers (12.96 ± 1.34 years) compared with the right-handers (13.72 ± 1.41 years; p = 0.025). The earliest menarcheal age was 9.4 years in left-handers and 10.1 years in right-handers. The menarche did not start after the age of 16 years in any of the girls. The mean duration of the menstrual cycle was similar for both groups.

The menarcheal age was found to be 13.34 ± 1.35 years for the whole group.

Discussion

Menarche, the first menstrual period, is believed to be influenced by many factors including altitude. Epidemiological studies are required to determine the conditions regarding pubertal development in society and to repeat these studies at certain intervals. Considering this fact, we decided to conduct the present study in Erzurum, the only large town situated in a temperate climate zone with a crowded population standing at an altitude over 2000 m. Our study is the first research to investigate menarcheal age in our region; and the mean menarcheal age was found to be 13.34 ± 1.35 years. This value was not significantly different from 13.28 ± 1.09 years found amongst school girls in Istanbul (at sea level).10 It is suggested that later age at menarche is an independent effect of altitude.11 Growth and development at high altitudes (3600 m above sea level) resulted in a delay in median age of menarche of about 0.8 years.12 Freyre and Ortiz13 evaluated the effect of altitude on adolescent growth and development and found that puberty at mid-altitude appeared to start at a similar age but lasted longer than at sea level. In the same study, puberty at high altitude started significantly later and was more prolonged than at sea level and mid-altitude.13 Our data revealed relatively little but no significant effect of altitude upon menarcheal age. One reason may be that Erzurum (2000 m above sea level) is not situated at a high enough altitude to significantly affect the age at which menarche is attained.

Functional brain asymmetry influences many functions of the organism. However, the neuroendocrine axis is one that has received insufficient attention. Different reports about the link between functional brain asymmetry and menarcheal age exist in the literature. Nicholls and Forbes14 found no differences between dextral and sinistral groups for breast size, menstrual regularity, or age at menarche. Nikolova, et al.15 interviewed by questionnaire 1695 females, aged between 16 and 25 years, about manual dominance and menarcheal age. They found a significantly lower average age of menarcheal appearance in the left-handers (12.09 ± 0.16 years) compared with the right-handers (13.32 ± 0.12 years; p < 0.001). The brain might control gonadal functions by a pituitary-independent mechanism, and the gonads might neurally feedback on cerebral structures.16 Interestingly, the results of the experiment, in which the gonadotropic hormone-releasing hormone (GnRH) content of the hypothalamus, studied in hemiovariectomized rats, indicated that in intact control animals the GnRH content is significantly higher in the right half of the hypothalamus than in the left half.17 Furthermore, polycystic ovarian syndrome is predominantly associated with left-sided epileptiform discharges, whereas hypothalamic amenorrhea is related predominantly to right-sided discharges.18 A possible relationship between handedness and female reproductive functions is suggested by the earlier appearance of both menarche and menopause in left-handed women.15 Our data lead us to accept the existence of a link between functional brain asymmetry and menarche. It is suggested that activation of the hypothalamic–pituitary–gonadal axis is earlier in left-handed females than right-handed females.

References