

The Mean Age at Menarche of Irish Girls in 2006

Abstract:

Abstract Strong evidence exists of a downward secular trend in the age at menarche; which appears to be associated with improved health and nutritional circumstances over the past two centuries. The aim of this study was to determine the mean age at menarche of Irish girls in 2006, as this has not been verified since 1986. A nationally representative sample of Irish girls (n= 4720, age 10-18 years) was obtained from the 2006 Irish Health Behaviour in School Aged Children survey and mean menarcheal age was calculated using the recall method. Mean age at menarche decreased from 13.52 years in 1986 to 12.53 years in 2006 and was lowest in cities and among manual groups. No significant differences were found between Irish-born and immigrant girls. Ongoing observation of this biological milestone is warranted to identify whether this secular trend will stabilise in Ireland and at what age. Consequences of earlier biological maturation on adolescent health behaviours and outcomes should also be monitored.

Introduction

Menarche, the most robust historical marker of the timing of puberty¹, is of major biological and psychological significance for females. It is a highly complex developmental milestone, influenced by genetic and environmental factors such as ethnicity, social class, geographical area, BMI and pre-pubertal fat²⁻⁵. Furthermore age at menarche has been associated with prenatal and postnatal factors during early development; including size at birth⁶, rapid postnatal weight gain and growth^{7,8} and stressful childhood experiences⁹. European records have shown a marked reduction in the age at menarche of approximately 3 years for every 100 years¹⁰. This reduction has been interpreted as a reflection of improved nutrition and decreased infection in childhood¹⁰. In Ireland, age at menarche was last examined by Hoey et al in 1986 with a representative sample of 9-17 year old girls in Dublin and other areas in the east of Ireland (n=2940). The mean age at menarche was found to be 13.52 years \pm 0.08 with a standard deviation of 1.3 years¹¹. The aim of this study is to present the mean age at menarche of Irish girls in 2006.

Methods

Data from the 2006 Irish Health Behaviour in School Aged Children (HBSC) survey (www.hbsc.org) were used for this study. Self-completion questionnaires were distributed to a nationally representative sample of children aged 10-18 years, attending Department of Education and Science listed schools in the Republic of Ireland. The standardised World Health Organisation (WHO) questionnaire was administered by teachers in the classroom and completed anonymously. HBSC Ireland 2006 was funded by the Department of Health and Children. Full ethical approval was granted by the Research Ethics Committee of the National University of Ireland, Galway. In total, 63% of invited schools responded to the survey and 83% of targeted students in those schools completed questionnaires; comprising 5035 females. Mean menarcheal age was calculated using the recall method; girls were asked to specify menarcheal age in years and months, provided they had started menstruating. No answer was given by 315 females; therefore, 4720 10-18 year old girls were included in this study, of which 1519 reported not having menstruated yet. Of the 3201 girls who had reached menarche, 614 provided menarcheal age in years only, therefore a standard 0.5 years was allocated to these participants. In addition to national data, specific results regarding geographical location (city, town, village, country and Dublin City) were analysed according to social class (SC), obtained from parental occupational data. The non-manual group represented SC 1 (professional), SC 2 (managerial/technical) and SC 3 (skilled non-manual). The manual group represented SC 4 (skilled manual), SC 5 (partly skilled) and SC 6 (unskilled).

Specific Dublin City information was extracted as this represented the largest city area and to approximate the 1986 study, which represented data from Dublin City separately¹¹. Finally, all those born outside of Ireland, or who reported that both of their parents were born outside of Ireland, labeled immigrants, were removed from the main sample and data on the menarcheal age of this sub-group are presented separately. Mean age at menarche and standard deviation were calculated using SPSS (version 15). One-way ANOVA (and Tukey HSD post-hoc tests) were used to test for significance between city, town, village and country data. Independent t-tests were used to test for the significance of differences between data from manual and non-manual groups and between national and Dublin city only data.

*Geographical area: classified by the question "where do you live: city/town/village/country"
§Social class: classified according to parental occupation.

Results

The mean age at menarche of all girls in the 2006 sample (including Dublin city) was 12.53 \pm 0.02 years with a standard deviation of 1.13 years; Irish-born (n = 3015) mean 12.54 \pm 0.02 (sd 1.12); immigrant (n = 186) mean 12.45 \pm 0.08 (sd 1.11). No significant difference was found between different geographical areas overall or within either the Irish-born or immigrant sub-samples; however age at menarche tended to be higher in more rural areas compared to the city (Table 1). The lowest mean age at menarche was found in Dublin City but this figure was not significantly different from the national data (Table 2). In all geographical areas, mean age at menarche was lower in the manual group compared to the non-manual group; however the differences were not statistically significant in the overall sample or in either the Irish-born or immigrant sub-samples.

§Social class: classified according to parental occupation.

Discussion

In 2006¹¹, the mean age at menarche of girls in Ireland was found to be 12.53 \pm 0.02 years, thus representing a decrease from 13.52 \pm 0.08 years in 1986¹¹. The Irish population has become more ethnically diverse over the last 20 years; as ethnicity has been shown to influence age at menarche² this may have accounted for some of the difference between the data from 1986 and 2006. However, in the HBSC Ireland 2006 dataset only 5.5% of girls nationally and 6% in the Dublin City area were classified as immigrants. Furthermore, no significant differences were identified between girls born in Ireland and immigrants, in terms of either the mean age of menarche or in geographical or social class patterns in menarcheal age. This in turn may be somewhat explained by the sheer diversity of the immigrant sub-sample, representing some 53 different countries. Of growing interest is whether or not the current epidemic in childhood obesity will fuel a trend towards earlier age at menarche in Ireland, since obesity has been repeatedly associated with earlier menarcheal age^{4,5,12,13}. Data from the last 50 years have identified that in the majority of North-West European countries and the US, the trend is beginning to stabilise^{2,7,13,14}, whereas more recent rapid rates of decline in the age at menarche have been reported in less developed populations where mean age at menarche is, in general, higher^{5,16}. It has been proposed that in countries where the decline in menarche has slowed or stopped, the mean age at menarche has reached the so-called genetic lower limit, the point at which the age at menarche will no longer reduce further². This theory has been supported by data illustrating that in developed countries where there is an appropriate average standard of living, with adequate healthcare and nutrition, genetic (rather than environmental) factors determine mean age at menarche². A strong link between genetics and mean age at menarche has been repeatedly identified^{2,7,12}.

In the last decade it has been found that in developed countries inequalities in social and economic status, although still present, do not strongly determine age of menarche, since living conditions are generally good and slight deteriorations or improvements do not significantly affect menarche³. This is consistent with the Irish study in 1986¹¹ and the present study where social class or urban/rural dwelling was not significantly associated with menarcheal age. However, in 2006, although there were no significant differences between geographical areas and social class, a trend was identified. Mean age at menarche was lowest in the city and highest in the countryside, this is consistent with the Irish study in 1986¹¹ and studies in Poland³, Kazakhstan⁷, China¹⁸ and Spain¹⁹. Furthermore, a trend towards earlier age at menarche in the manual group compared to the non-manual group was identified; although it was not significant, this does not concur with previous studies, which reported an association between earlier age at menarche and higher socioeconomic status^{3,20}.

The main limitation of this study was the accuracy of recall of age at menarche. However, a previous study of adolescents found substantial correlation between self-reported age at menarche and medical records²¹, studies have also found that age at menarche is a relatively salient, unforgettable event^{6,22} and accurately recalled over short interval periods²². However, direct comparison of the Irish study in 1986¹¹ and the present study is not straightforward since two different methodologies were used to calculate mean ages at menarche, the status quo method was used in 1986 (girls were asked whether or not they had begun their menstrual periods)¹¹, while the recall method was used in the present study (girls were asked to specify age at menarche in years and months). It should be noted that recent data from Kazakhstan⁷ suggest that there are no significant differences between these two methodologies for determining average menarcheal age. Early age at menarche, defined as less than 10 or 11 years of age^{2,23}, has been associated with an increased risk of several negative health outcomes²⁴⁻²⁶ and risk behaviours^{23,27-30}. However, the present study did not examine the health behaviours or outcomes of early maturing girls relative to their peers, therefore no inferences can be drawn from this study about the detrimental outcomes associated with early age at menarche.

In conclusion, this study found that the age at menarche of Irish girls has decreased from 13.52 years to 12.53 years over the last 20 years. Ongoing monitoring of this important biological milestone is warranted to identify a population average lower age limit in Ireland. Additional longitudinal studies are also justified to compare the health behaviours and outcomes of girls who mature early relative to their peers and to identify whether a national average decrease in the age at menarche will result in an increase in adolescent risk behaviour. Such data would assist clinicians, teachers and parents to provide appropriate care and integration of early maturing girls into society.

Acknowledgements

HBSC Ireland 2006 was funded by the Department of Health and Children. The International WHO-HBSC study⁰ is co-ordinated by Professor Candace Currie of the University of Edinburgh. We thank all the children, parents and teachers who participated.

Correspondence: S Nic Gabhainn
Health Promotion Research Centre, School of Health Sciences, National University of Ireland, Galway
Tel: + 353 91 493093
Fax: + 353 91 494577
Email: saoirse.nicgabhainn@nuigalway.ie

References

1. Ong KK, Ahmed ML, Dunger DB. Lessons from large population studies on timing and tempo of puberty (secular trends and relation to body size): The European Trend. *Mol Cell Endocrinol* 2006; 254-255: 8-12.
2. Chumlea WC, Schubert CM, Roche AF, Kulin HE. Age at menarche and racial comparisons in US girls. *Pediatrics* 2003; 111: 110-3.
3. Wronka I, Pawlinska-Chmara R. Menarcheal age and socio-economic factors in Poland. *Ann Hum Biol* 2005; 32: 630-8.
4. Lee JM, Appugliese D, Kaciroti N, Corwyn RF, Bradley RH, Lumeng JC. Weight status in young girls and the onset of puberty. *Pediatrics* 2007; 119: e624-30.
5. Adair LS. Size at birth predicts age at menarche. *Pediatrics* 2001; 107: e59-65.
6. Ong KK, Northstone K, Wells JCK, Rublin C, Ness AR, Golding J, et al. Earlier mother's age at menarche predicts rapid infancy growth and childhood obesity. *PLoS Medicine* 2007; 4: e132-7.
7. Belsky J, Steinberg LD, Houts RM, Friedman SL, DeHart G, Cauffman E, et al. Family rearing antecedents of pubertal timing. *Child Dev* 2007; 78: 1302-21.
8. Kim K, Smith PK. Childhood stress, behavioural symptoms and mother-daughter pubertal development. *Journal Adolesc* 1998; 21: 231-40.
9. Gluckman PD, Hanson MA. Evolution, development and timing of puberty. *Trends Endocrinol Metab* 2006; 17: 7-11.
10. Padez C, Rocha MA. Age at menarche in Coimbra (Portugal) school girls: a note on the secular changes. *Ann Hum Biol* 2003; 30: 622-32.
11. Hoey H, Cox L, Tanner J. The age of menarche in Irish girls. *Ir Med J* 1986; 79: 283-5.
12. Ersoy B, Balkan C, Gunay T, Egeman A. The factors affecting the relation between the menarcheal age of mother and daughter. *Child Care Health Dev* 2005; 31: 303-8.
13. Juul A, Teilmann G, Scheike T, Hertel NT, Holm K, Laursen EM, et al. Pubertal development in Danish children: comparison of recent European and US data. *Int J Androl* 2006; 29: 247-55.
14. Mul D, Fredriks AM, van Buuren S, Oostdijk W, Verloove-Vanhorick SP, Wit JM. Pubertal development in the Netherlands 1965-1997. *Pediatr Res* 2001; 50: 479-86.
15. Wang D, Murphy M. Trends and differentials in menarcheal age in China. *J biosoc Sci* 2002; 34: 349-61.
16. Hwang JY, Shin C, Frongillo EA, Shin KR, Jo I. Secular trend in age at menarche for South Korean women born between 1920 and 1986: the Ansan study. *Ann Hum Biol* 2003; 30: 434-42.
17. Facchini F, Fiori G, Bedogni G, et al. Puberty in modernizing Kazakhstan: A comparison of rural and urban children. *Ann Hum Biol* 2008; 35: 50-64.
18. Hesketh T, Ding QJ, Tomkins A. Growth status and menarche in urban and rural China. *Ann Hum Biol* 2002; 29: 348-52.
19. Marrodan MD, Mesa MS, Arechiga J, Perez-Magdalen A. Trend in menarcheal age in Spain: rural and urban comparison during a recent period. *Ann Hum Biol* 2000; 27: 313-9.
20. Ersoy B, Balkan C, Gunay T, Onag A, Egemen A. Effects of different socioeconomic conditions on menarche in Turkish female students. *Early Hum Dev* 2004; 76: 115-25.
21. Hornberger LL, Rosenthal SL, Biro FM, Stanberry LR. Sexual histories of adolescent girls: comparison between interview and chart. *Journal Adolesc Health* 1995; 16: 235-9.
22. Koo MM, Rohan TE. Accuracy of short-term recall of age at menarche. *Ann Hum Biol* 1997; 24: 61-4.
23. Edgardh K. Sexual behaviour and early coitarche in a national sample of 17 year old Swedish girls. *Sex Transm Inf* 2000; 76: 98-102.
24. Beji NK, Reis N. Risk factors for breast cancer in Turkish women: a hospital-based case-control study. *Eur J Cancer Care* 2007; 16: 178-84.
25. Lakshman R, Forouhi N, Luben R, et al. Association between age at menarche and risk of diabetes in adults: results from the EPIC-Norfolk cohort study. *Diabetologia* 2008; 51: 781-6.
26. Hulanicka B, Lipowicz A, Koziel S, Kowalisko A. Relationship between early puberty and the risk of hypertension/overweight at age 50: Evidence for a modified Barker hypothesis among Polish youth. *Econ Hum Biol* 2007; 5: 48-60.
27. Kaltiala-Heino R, Marttunen M, Rantanen P, Rimpela M. Early puberty is associated with mental health problems in middle adolescence. *Soc Sci Med* 2003; 57: 1055-64.
28. Michaud PA, Suris JC, Deppen A. Gender-related psychological and behavioural correlates of pubertal timing in a national sample of Swiss adolescents. *Mol Cell Endocrinol* 2006; 254-255: 172-8.
29. Dick DM, Rose RJ, Viken RJ. Pubertal timing and substance use: associations between and within families across late adolescence. *Dev Psychol* 2000; 36: 180-9.
30. van Jaarsveld CHM, Fidler JA, Simon AE, Wardle J. Persistent impact of pubertal timing on trends in smoking, food choice, activity and stress in adolescence. *Psychosom Med* 2007; 69: 798-806.

Comments:

OtherReferences:

Acknowledgement: