# Age of onset of thelarche in urban school girls of Kalaburagi, Karnataka: A cross sectional study

Roopa Mangshetty[1*], Amruthvarshini Inamadar[2], Sharanagouda Patil[3]

[1]Associate Professor, [2]Postgraduate, [3]Professor and HOD, Department of Pediatrics, M.R. Medical College, Kalaburagi, INDIA.
**Email:** rmangshetty@gmail.com , amrutha.inamadar@gmail.com , drsharanpatil@gmail.com

**Abstract**
**Background:** Timing of normal pubertal maturation has received increased attention over the past several years. More recently, age of onset of pubertal maturation appears to have decreased, especially in girls. **Aim:** To evaluate the age of onset of thelarche in urban school girls of Kalaburagi, Karnataka. **Material and Methods:** This cross-sectional study was conducted on 1500 urban school girls of Kalaburagi, Karnataka. All the girls were screened by breast examination using Tanner staging between the age 6-14years. The girl child's BMI was also done as a standard measure in all the girls. **Results:** Out of 1500 girls, 105 (38.3%) between the age group 6-7 had early thelarche, followed by 75(27.4%) between the age group 10-11years. A significant onset of thelarche by seven months was noted in over weight and obese girls. **Conclusion:** The study provides the normative data for onset of thelarche in urban school girls of Kalaburagi. Thelarche onset occurs earlier in overweight and obese girls
**Key Word:** Urban school girls, Thelarche, obesity, Basal metabolic rate

*Address for Correspondence:
Dr. Roopa Mangshetty, Associate Professor, Department of Pediatrics, M R Medical College, Kalaburagi, Karnataka, INDIA.
**Email:** rmangshetty@gmail.com

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## INTRODUCTION

Timing of normal pubertal maturation has received increased attention over the past several years. Age of thelarche showed a dramatic decrease in the first half of the 20th century. More recently, age of onset of pubertal maturation appears to have decreased, especially in girls.[1] Sexually dimorphic development of the breast first begins at puberty and unlike the preceding stages of development, pubertal changes are heavily under the influence of sex hormones, in particular estrogen.[2] Tanner described the most well-accepted macroscopic stages of development in the breast at puberty. Breast development is generally the first secondary sexual characteristic to develop, preceding pubic hair development by about 6 months.[3,4] Excess adiposity may also influence various aspects of pubertal development, such as the timing of pubertal initiation and hormonal parameters during puberty.[5] Adiposity in early childhood also appears to be linked to advanced thelarche in girls.[6] Girls with excessive Body Mass Index (BMI) are more likely to have thelarche between ages 8.0 and 9.6 years compared to girls with normal BMI.[7] We are still in dark regarding various aspects of the influence of obesity on pubertal development. More research is needed to clearly understand the factors affecting early onset of thelarche. This cross-sectional study was conducted to evaluate the age of onset of thelarche in urban school girls of Kalaburagi, Karnataka.

## MATERIAL AND METHODS

This cross-sectional study was conducted on1500 urban school girls of Kalaburagi, Karnataka over a period of two years. In our study all the girls were screened by breast examination using Tanner staging between the age 6-14years. Along with screening for thelarche the girl child's BMI was also done as a standard measure in all

the girls. All measurements were made with participants dressed in minimal light clothing without footwear. Height was measured with portable Holtain's stadiometer (Holtain Inc., Crymych, Pembs. UK). Weight was measured with the digital weighing machine. The Girl child with increased BMI was also given lifestyle modification advice based on the BMI. BMI was measured using Quetelet index and the girls were classified into Underweight, normal, overweight and obese category according to IAP. The socio-economic status depending on the father's education, occupation, and income was divided into 5 classes (Modified Kuppuswamy scale 2016) and the relationship of socio-economic status to sexual maturity rating was studied.

**Inclusion criteria**
- School girls from urban schools of Kalaburagi, Karnataka between 6-14 years (apparently healthy).

**Exclusion criteria**
- Children with history of chronic systemic illness.
- Children taking any medication for more than one month in last three months.

**Statistical analysis:** All characteristics were summarized descriptively. For continuous variables, the summary statistics of mean± standard deviation were used. For categorical data, the number and percentage were used. Chi-square ($\chi^2$) test was used for association between two categorical variables. p-value <0.05 was considered statistically significant. Data were analyzed using SPSS software v.23.0. and Microsoft office 2007.

## RESULTS

A total of 1500 girls were recruited for the study, maximum number of subjects 414(27.6%) belonged to the age group of 6-7years followed by 407(27.1%) in the age group 12-14years, 368 (24.5%) in the age group 10-11years and 311(20.7%)in the age group 8-9years. Our study reports the mean age of onset of the larche to be 9.6 years +/-2.5 SD. Among the 1500 girls included in the study, maximum number of girls 836 (55.7%) had Tanner stage 1 followed by 483(32.2%) had Tanner stage 2, 145(9.7%) had Tanner stage 3, 28(1.9%) had stage Tanner 4 and 8(0.5%) had stage 5.

**Table 1:** Distribution of cases according to tanner stage

| Tanner stage | No. of cases | Percentage |
|---|---|---|
| 1 | 836 | 55.7 |
| 2 | 483 | 32.2 |
| 3 | 145 | 9.7 |
| 4 | 28 | 1.9 |
| 5 | 8 | 0.5 |
| **Total** | **1500** | **100** |

Among the 1500 urban school girls, maximum number 884(58.9%) had normal BMI, followed by 282 (18.8%) were overweight, 171(11.4%) were underweight and 163(10.9%) were obese. Prevalence of obesity and overweight among urban school girls between age 6-14years in our study was 22.3% with a mean BMI of 16.9±3.4SD.

**Table 2:** Association of onset of early thelarche with age

| Age (years) | Early thelarche | | | | | | p value |
| | Yes | | No | | Normal | | |
| | No. | % | No. | % | No. | % | |
|---|---|---|---|---|---|---|---|
| 6-7 | 105 | 38.3% | 7 | 36.8% | 302 | 25.0% | |
| 8-9 | 55 | 20.1% | 5 | 26.3% | 251 | 20.8% | <0.001 (Significant) |
| 10-11 | 75 | 27.4% | 5 | 26.3% | 288 | 23.9% | |
| 12-14 | 39 | 14.2% | 2 | 10.5% | 366 | 30.3% | |
| Total | 274 | 100.0% | 19 | 100.0% | 1207 | 100.0% | |

A total of 1500 girls were examined for the study, 105(38.3%) between the age group 6-7 had early the larche, followed by 75(27.4%) between the age group 10-11years, 55(20.1%) between the age 8-9years and 39(14.2%) between the age 12-14years. The study showed that the association between early thelarche and age was significant with a p value of <0.001.

**Table 3:** Mean age of girls with thelarche in association with socioeconomic status

| Socioeconomic Status | Thelarche | | | | | |
| | Yes | | No | | Normal | |
| | Mean | SD | Mean | SD | Mean | SD |
|---|---|---|---|---|---|---|
| Upper Middle | 8.8 | 2.3 | 8.7 | 1.9 | 9.8 | 2.4 |
| Lower Middle | 9.2 | 2.4 | 9.0 | 2.5 | 9.9 | 2.8 |
| Total | 8.9 | 2.3 | 8.8 | 2.2 | 9.8 | 2.5 |
| p Value | 0.414 | | 0.751 | | 0.316 | |

The mean age of thelarche in upper middle class girls with high BMI was 8.8±2.3years as compared with the mean age of thelarche in lower middle class girls with high BMI was 9.2±2.4 years.

**Table 4**: Mean age of girls with thelarche in association with BMI

| Early thelarche | Mean | Age SD | P value |
|---|---|---|---|
| Yes | 8.9 | 2.3 | |
| No | 8.8 | 2.2 | <0.001 (Significant) |
| Normal | 9.8 | 2.5 | |
| Total | 9.6 | 2.5 | |

A total of 1500 girls were examined for the study, the mean of thelarche in overweight/obese girls was 8.9±2.3 years. A significant of onset of thelarche by 7 months (p<0.05). The study which comprised of 1500 healthy girls between 6-14years estimated that the mean age of menarche in girls with high BMI was 10.5±0.6 years. Our study shows that girls who had menarche before 12.5years had higher BMI(p<0.05) which was also associated with early thelarche.

## DISCUSSION

The timing of female puberty has attracted considerable interest in both lay and medical communities. A clear secular trend towards earlier age of thelarche over the past 40 years has been described by several large US studies. The Third National Health and Nutrition Examination Study (NHANES III), a population-based study conducted between 1988 and 1994, found the median age of thelarche for NHC to be 10.4 years,[8]significantly earlier than previously reported.[9] A definite association exists between increasing BMI and earlier pubertal development in girls.[10]Adiposity has been proposed as a metabolic gatekeeper of central pubertal initiation but the postulation that central activation of GnRH- gonadotropin axis in obese girls may be the cause for premature thelarche has not been proven. The peripheral aromatization of the vast adipose tissue androgens to estrogens,[11] the insulin-induced reductions of sex hormone binding globulin (SHBG) which increases bioavailability of sex steroids including estradiol,[12] and the hyperinsulinemia in obese girls contribute to early onset of thelarche. However, the time from thelarche to menarche may be delayed in obese girls suggesting that the increase in estrogen in obesity may not be gonadotropin-dependent,[13] and the isolated menstrual bleeds may represent non-ovulatory bleeding.[12] A descriptive study was conducted on urban school girls between the age 6- 14years fulfilling the inclusion criteria over a period of 18months. Our study highlights the age of onset of thelarche and also age of onset of thelarche in relation to BMI. A total of 1500 girls were recruited for our study, maximum number of subjects 414(27.6%) belonged to the age group of 6-7years. Our study reports the mean age of onset of thelarche to be 9.6±2.5 years. A study done by Khadgawat *et al*, two thousand and ten school girls aged 6-17years were examined for onset of thelarche and those with history of any systemic illness or taking any treatment for more than one month in last three months were excluded from the study and the results showed Mean (95% CI) age of thelarche as 10.8 (9.7-10.9) years.[14]A study done by Sussane *et al* in healthy female children and adolescents of USA revealed that mean age of thelarche was 9.7 years among 610 females aged 3.0–17.9 years.[15]In an another study done by Malleswari *et al* in school girls between 8-17 years showed that the mean age of onset of Thelarche was 10.68years.[16]Our present study shows the age of onset to be in accordance and almost similar with the study done by the above authors mentioned.

## CONCLUSION

The study provides the normative data foronset of thelarche in urban school girls of Kalaburagi. The mean age of onset of thelarche was 9.6±2.5 years. Thelarche onset occurs earlier in overweight and obese girls.

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