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# The Influence of Age at Menarche on the Menstrual Pattern of Polish University Students

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A B S T R A C T

**Purpose:** The aim of the study was to examine the relationships between age at menarche and menstrual cycle characteristics in young female subjects.
**Methods:** Anthropometric measurements were performed, and questionnaire data were collected from 1,323 women, aged 19–25 years.
**Results:** No differences were found in terms of cycle duration or the number of days of bleeding between women with early, average, or late menarche. Each of those groups had a similar percentage of women who declared that their cycles last longer than 35 days, those who declared that their cycles are shorter than 21 days, and those who reported prolonged bleeding. Irregular cycles were associated with late age at menarche. Women with early age at menarche complained about menstrual cramps more frequently. The existence of a relationship between age at menarche and menstrual cycle disorders was confirmed by the results of logistic regression.
**Conclusions:** Both early and late age at menarche are associated with increased risk of menstrual cycle disorders.

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**IMPLICATIONS AND CONTRIBUTION**

These results demonstrated that menstrual disorders are prevalent among women aged 19–25 years. The findings of this study show significant differences in the prevalence of menstrual pain and irregular cycle between women with early menarche and women with late menarche. Age at menarche appears to have an impact on female's health.

It has been proved that age at first menstruation as well as menstrual pattern are important predictors of women's health. Evidence links early age at menarche to higher incident obesity, cardiovascular disease, coronary heart disease, and certain cancers, whereas late menarche is connected with osteoporosis and bone fracture [1]. Menstrual pattern is associated not only with reproductive health but also with a risk of cardiovascular and metabolic diseases, breast cancer, and osteoporosis [2,3]. Despite research on the determinants and health implications of both age at menarche and menstrual pattern, little is known about the relationship between them. Several studies have assessed age at menarche as a potential risk factor for menstrual disorders; however, the results are in conclusive [4–10].

The aim of our study was to examine the relationships between age at menarche and menstrual cycle characteristics, including the incidence of menstrual disorders in young women.

## Materials and Methods

The research was carried out in the period from 2015 to 2017 among 1,305 female students of universities in a number of Polish cities. The study protocol was approved by a local ethics committee. Data on age at menarche and on the characteristics of

the menstrual cycles (regularity and duration), the number of bleeding days, menstrual pains, overall health, and socioeconomic status were obtained from a questionnaire. To measure the regularity of menstrual cycles, we classified those with a difference of 7 days or more as having irregular cycles. Menstrual disorders are defined as follows: *oligomenorrhea*: cycle repeated once every >35 days but <3 months; *polymenorrhea*: cycle repeated once every <21 days; *hypomenorrhea*: duration of menses <3 days; and *hypermenorrhea*: duration of period >7 days. Primary d*ysmenorrhea* was reported as an acute spasmodic pain, experienced in the lower abdomen, usually beginning a day or two before menstrual flow and continuing through the first 2 days of menstruation. Anthropometric measurements were taken according to current anthropometric methodology, and body mass index, waist to height ratio, and waist to hip ratio were calculated.

A total of 405 subjects were excluded because of factors that can significantly influence their menstrual patterns (diagnosis of any gynecological and hormonal disorders, a major abdominal surgery, and using contraceptives or other hormone medicaments in the preceding year). A total of 900 healthy Caucasian women aged 19—25 years were included in the subsequent analysis.

In statistical analysis, a chi-square test, analysis of variance, and logistic regression were used. For the purpose of this study, a significance level of $p < .05$ was assumed.

## Results

The mean age at menarche was $12.73 \pm 1.35$ years, with a range of 11—15 years. Each of the subjects experienced their first menstrual period at least 5 years before the survey. Age at menarche <12 years was classified as early, 12—14 years as average, and >14 years as late.

No differences were found in terms of cycle and bleeding duration between women with early, average, or late menarche (Table 1). Each of those groups had a similar percentage of women who declared that their cycles last longer than 35 days, those who declared that their cycles are shorter than 21 days, and

those who reported prolonged bleeding. Irregular cycles in women with late menarche occurred significantly more often than in those with average or early menarche. Women with early menarche complained about menstrual cramps more frequently (Table 1).

The existence of a relationship between age at menarche and menstrual cycle disorders was confirmed by the results of logistic regression. No relationship between age at menarche and the likelihood of *polymenorrhea*, *oligomenorrhea*, and *hypermenorrhea* was reported (*p*-values > .05). The risk of irregular cycles was significantly lower for women with early menarche than in those with average or late menarche, whereas the risk of menstrual cramps was significantly higher. Similar results were obtained after adjusting for indexes related to the amount and distribution of the adipose tissue: body mass index, waist to height ratio, and waist to hip ratio (Table 2).

## Discussion

In the literature, there are few studies on the relationship between age at menarche and the menstrual pattern. Most of the publications deal with *primary dysmenorrhea*. Early menarche is considered one of the risk factors, and our study yielded conclusions consistent with the finding [4—6]. We also showed that late age at menarche increases the risk of irregular cycles in adulthood. This result is consistent with the results of other research [7,8].

Our study did not demonstrate a statistically significant relationship between age at menarche and cycle length. Research findings concerning cycle duration are inconsistent. Early menarche has been shown to be associated with both short [9] and long cycles later in life [10]. There are some articles in which late maturation is considered the main risk factor of *oligomenorrhea* [10]. It has also been reported that women with late onset of menstruation have longer cycles [10].

The relationship between age at menarche and menstrual pattern is mostly explained by hormonal factors, but it may also be an indirect effect of differences in adiposity. Age at menarche is inversely proportional to adiposity, which is associated with menstrual disorders [1]. Irregular and/or anovulatory cycles, as well as too long cycles, occur more frequently in women with excessively low or high amounts of the adipose tissue [2].

Understanding the link between age at menarche and menstrual pattern may contribute to the explanation of the etiology of menstrual disorders, and consequently of many, not only gynecological, conditions. Given the limited number of studies on

**Table 1**
Menstrual variables in relations to age at menarche

| Menstrual variables | Age at menarche | | | *p* values |
|---|---|---|---|---|
| | Early | Average | Late | |
| Length of cycle, mean (SD) | 28.67 (2.23) | 28.61 (2.19) | 28.70 (2.40) | .87 |
| Bleeding length, mean (SD) | 5.30 (1.14) | 5.27 (1.20) | 5.36 (1.15) | .54 |
| Regularity, n (%) | | | | |
| No | 19 (8.88) | 67 (14.14) | 42 (19.91) | .0050 |
| Yes | 195 (91.12) | 408 (85.86) | 169 (80.09) | |
| Menstrual pain, n (%) | | | | |
| No | 53 (24.77) | 166 (35.02) | 90 (42.65) | .0005 |
| Yes | 161 (75.23) | 309 (64.98) | 121 (57.35) | |
| Length of cycle, n (%) | | | | |
| <28 days | 4 (1.87) | 7 (1.47) | 4 (1.89) | .99 |
| 28—35 days | 205 (95.79) | 455 (95.79) | 202 (95.74) | |
| >35 days | 5 (2.34) | 13 (2.74) | 5 (2.37) | |
| Bleeding length, n (%) | | | | |
| 3—7 days | 211 (98.60) | 469 (98.73) | 207 (98.11) | .45 |
| >7 days | 3 (1.40) | 6 (1.27) | 4 (1.89) | |

SD = standard deviation.

**Table 2**
The risk of menstrual disorders in relations to age at menarche

| Menstrual disorders | Age at menarche | | | *p* values |
|---|---|---|---|---|
| | Early OR (95% CI) | Average OR (95% CI) | Late OR (95% CI) | |
| Irregular cycles | .60 (.98—2.31)[a] | 1 Ref. | 1.51 (.35—1.01)[a] | .0047 |
| | .64 (.99—2.11)[b] | 1 Ref | 1.75 (.36—.04)[b] | .0043 |
| Dysmenorrhea | 1.64 (1.14—2.35) | 1 Ref. | .72 (.52—1.00) | .0004 |
| | 1.78 (1.23—2.42) | 1 Ref. | .76 (.53—1.01) | .0006 |

CI = confidence interval; OR = odds ratio.
[a] Odds ratio crude.
[b] Odds ratio adjusted for body mass index, waist to height ratio, and waist to hip ratio.

this topic, further research is needed to cover women of different ages and ethnicity and to determine whether the relationship between age at menarche and menstrual cycle pattern is the same in all groups.

## Funding Sources

## Supplementary Data

Supplementary data related to this article can be found at https://doi.org/10.1016/j.jadohealth.2020.05.037.

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