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The relationship between age at menarche and infertility among Chinese rural women



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ABSTRACT

Objective: To explore the relationship between age at menarche and infertility.

Study design: The cross-sectional study investigated 6906 couples from the communities in Sandu Shui Autonomous County of Guizhou Province, China. Face to face interviews were conducted to collect information on age at menarche and time to first pregnancy, as well as demographic characteristics and lifestyle factors. Infertility was defined as being unable to become pregnant after attempting for ≥ 12 months. Poisson regression was used to assess the relationship between age at menarche and infertility of first attempt.

Results: The prevalence rate of infertility for the first pregnancy attempt of the study population was 11.87%. There is an obvious monotonic, almost linear, trend of prevalence rate of infertility with increasing age at menarche (P for trend: < 0.001). Compared with wives with age at menarche of 13 years, the prevalence ratios of infertility were 0.71 (95%CI: 0.42, 1.20), 1.33 (95%CI: 1.05, 1.68), 1.47 (95%CI: 1.17, 1.85), 1.57 (95%CI: 1.20, 2.04), 1.41 (95%CI: 1.00, 1.99) and 1.73 (95%CI: 1.18, 2.52) for wives with age at menarche of ≤ 12 , 14, 15, 16, 17 and ≥ 18 years, respectively, after adjusting for wife's year at birth, age at marriage, ethnic group, education and occupation, and husband's smoking and drinking habits before marriage.

Conclusions: The present community-based study indicated that increasing age at menarche was associated with an increased risk of infertility in the study population.

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Introduction

Menarche is recognized as a milestone of puberty for girls, indicating the beginning of reproductive cycle. Studies have revealed that early occurrence of menarche is associated with adverse health outcomes including breast cancer [1,2] and cardiovascular diseases [3], while late occurrence of menarche is linked to osteoporosis and increased fracture risk [4,5]. All these

affected health conditions have hormonal (probably sexual hormones) relevance, which may also work on human fertility. Furthermore, studies have revealed that both early and late age at menarche may be associated with adverse pregnancy outcomes such as spontaneous abortions [6] and ectopic pregnancies [7].

However, the relationship between age at menarche and fecundity is unclear, since the few existing studies have produced conflicting results. The previous studies used different measures of fecundity such as prevalence rate of infertility [8,9] and "waiting time to pregnancy" (TTP) [10–12], or didn't clarify [13]. Some of the studies used the first pregnancy attempt of married couples [8–10], while others did not [11,12]. And studies taking female hairdressers as the study population [11] or excluding women with irregular cycles [12] might introduce selection bias. A most recent study based on Danish pregnant women concluded that later age at menarche was associated with a slightly higher risk of sub-fecundity (TTP ≥ 6 months) and infertility (TTP > 12 months),

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however the study missed those who were unable to get pregnant [14].

The aim of the present study was to investigate the relationship between age at menarche and infertility among Chinese women from a community-based study. We used the first pregnancy attempt for identification of infertility, because the later pregnancies had more chance of suffering from confounding by past pregnancy experience [15].

Materials and methods

Settings and study population

The cross-sectional study was conducted in Sandu Shui Autonomous County of Guizhou province, China. The county is in a mountain area of south-west China, with a predominantly rural population. Between November 2011 and August 2012, a total of 7600 couples who were born before January 1st, 1990 and lived in the county, were invited to take part in an investigation, and 7226 couples agreed to participate and signed the consent form.

Face to face interviews were conducted by trained interviewers using a structured questionnaire. Demographic characteristics, including date of birth, date of marriage, ethnic group, educational attainment and current occupation, were collected for all participants. The wife reported her age at menarche, pregnancy history, TTP, outcome and date of outcome for each pregnancy. If the husband smoked or drank alcohol, the age at which he started was recorded.

Statistical analysis

Following couples were excluded from the present analysis: (1) 9 couples who had never tried for a pregnancy, (2) 122 couples with wives' age at menarche or TTP missing, (3) 138 remarried couples, and (4) 51 couples who had been married for less than 1 year at the investigation. Finally, 6906 couples were included in the present analysis.

TTPs of couples' first pregnancies were collected by four categories as '<6 months', '6–11 months', '12–24 months' and '>24 months'. In the present analysis, couples with TTP of ≥ 12 months or being unable to conceive after trying for at least 12 months were defined as infertile according to definition of WHO [16]. Prevalence rate of infertility was calculated for the whole population and according to baseline characteristics. Chi-squared test was used to compare the prevalence rates of infertility across subgroups of couples by baseline characteristics.

To investigate the relationship between age at menarche and infertility, we estimated prevalence ratio (PR) of infertility using wives with menarche at 13 years as the reference group. Poisson regression was used to estimate PRs and 95% confidence intervals (CIs), as well as adjusted PRs after wife's year at birth, age at marriage, ethnic group, occupation and educational attainment, and husband's smoking and drinking habits before marriage were controlled for. We performed stratified analyses on couple's occupations (neither of the couple being migrant worker/either of the couple being migrant worker), wife's year at birth as well as couple's ethnic groups (both wife and husband with the same ethnicity). We repeated the analyses by using TTP of >24 months as another criteria of "infertility". Furthermore, to remove the confounding effect of unknown risk factors of infertility, we restricted the analysis to couples with live births, who were assumed to be more fertile.

In this study, the couple's ages at which they started to try for the first pregnancy were not collected, and it is impossible to calculate this important covariate based on the available data due

to the categorical nature of TTPs. Given that most Chinese couples in rural area did not use any contraceptive method before their first pregnancies (1995: 96%; 2009: 85%) [17,18], we hypothesized that couple's ages at marriage might serve as good surrogates for ages trying for first pregnancy in the study population. To corroborate the hypothesis, we calculated the TTPs for couples with live births by subtracting the wives' ages at marriage and 9 months from their ages at delivery and found that there was a good consistency between calculated TTPs and self-reported TTP categories (close to 90%). Hence, wife's age at marriage was adjusted as a surrogate for the age trying for first pregnancy.

Results

Wives' ages at menarche ranged from 10 to 23 years with a mean (standard deviation) of 14.58 ± 1.46 years in the study population. The majority (85%) of wives experienced their menarche between 13 years and 16 years. A total of 72.23% waited for less than 6 months to get pregnant, 15.90% for 6–11 months, 7.76% for 12–24 months and 4.11% for longer than 24 months or never got pregnant, corresponding to an overall prevalence rate of infertility of 11.87%.

The prevalence rate of infertility was highest for couples with wives born before the year of 1969 (15.67%), or being Miao ethnic (15.06%) or being migrant workers (14.86%), as well as for couples with husbands of the same characteristics. The prevalence rates of infertility were higher for couples with wives of an education of below primary school or college and above. Couples with husbands having smoking or drinking habit before marriage had a higher prevalence rate of infertility (Table 1).

There is an obvious monotonic, almost linear, trend of increased prevalence rate of infertility with increasing age at menarche (P for trend: <0.001). Compared with age at menarche of 13 years, the PRs were 0.71 (95%CI: 0.42, 1.20), 1.33 (95%CI: 1.05, 1.68), 1.47 (95%CI: 1.17, 1.85), 1.57 (95%CI: 1.20, 2.04), 1.41 (95%CI: 1.00, 1.99) and 1.73 (95%CI: 1.18, 2.52) for wives with age at menarche of ≤ 12 , 14, 15, 16, 17 and ≥ 18 years, respectively, after potential confounders were adjusted for (Table 2).

Stratification analyses based on occupation showed the trend that prevalence rate of infertility increased with increasing age at menarche persisted in those couples with neither of the couple being migrant worker, and the prevalence ratios increased slightly (Table 3). However, the association disappeared among couples with either of the couple being migrant worker (data not shown). Therefore, following subanalyses would be performed only in couples with neither of the couple being migrant worker.

When we used TTP of >24 months as the criteria of "infertility", the trend that prevalence rate of "infertility" increased with age at menarche did not essentially change, and the prevalence ratio of "infertility" for each category of age at menarche had a moderate increase (Table 4).

When the analysis was restricted to couples with live births, we got similar results (Table S1). When we stratified the analysis by wife's year at birth or by couple's ethnic groups, the estimates did not essentially change (Tables S2 and S3).

Comment

The present study indicated that later age at menarche was associated with a higher risk of infertility of first pregnancy among Chinese women, which is in line with two studies from China [9,10] and one study on Danish pregnant women [14]. The prevalence ratios remained similar when the analysis was restricted to several subgroups. However, it is not consistent with other studies [8,11,12], which concluded that age at menarche was not associated with fecundity. The difference might be due to the variety on study population and study design. Axmon [11] took

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