Age at first marriage and fertility in developing countries: A meta analytical view of 15 Demographic and Health Surveys

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1. Introduction

The reproductive performance and social status of women are largely explained by the age of their first marriage or cohabitation. In developing countries, high fertility is influenced by teenage pregnancy and early marriage. Early childbearing is influenced by early marriage and in most cases particularly in the developing world, the main purpose of marriage is to have children. Every year worldwide adolescents have more than 14 million births, and more than 90% of these occur in developing countries. Among all the birth of married women in many developing countries, about one-half and three quarters are found to be within two years of marriage. Taking children in an early age increases the fertility and the risks of mother and infant health including maternal mortality and morbidity as well as infant mortality, low birth weight and child stunting outcomes which is increased by poverty and inadequate access to maternal and child health service.

For adolescents, younger than 18 the maternal death risk during childbirth is 2–4 times higher than the women aged 20 or more. It is estimated that 70,000 teenage girls die each year in developing countries from causes related to pregnancy and childbirth. And 1 million children of teenage mothers die before reaching their first birthday. Additionally, marriage during adolescence or previous to the age of 18 is regarded as a violation of human rights. This is interconnected with a range of adverse social outcomes, involving gender-based violence, lower educational attainment, and disempowerment of women, greater poverty and economic insecurity. Increasing the age at first marriage meaning the delayed marriage diminish the duration of time available for childbearing (particularly where no-marital childbearing is rare) which directly influences fertility rates. Delayed married women get enough opportunity to complete their education and focus to develop a career. These career interests persuade women to limit family size. Early marriage of women usually varies in the different part of the globe. We try to describe the differentials among countries that can either increase or decrease the trends of high fertility concerned with early marriage. Our main target is to obtain the fertility performance of women that is accounted for the age at first marriage in the developing part. (See Table 3)

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2. Methods

2.1. Sources of data

The study uses data from the Demographic and Health Surveys (DHS). Considering the study objectives and availability of the variables required to conduct the study 15 DHS data have been chosen. The survey is based on a two-stage stratified sample of households where the entire country is divided into some non-overlapping enumeration areas that eventually edify the sampling frame. In the second stage of sampling a systematic sampling is appointed to pick out a fixed proportion of clusters and all the households within a cluster (enumeration area) is elected. Women aged 15–49 are selected and various personal and household information are retrieved from them. It is believed that the methodology used by DHS is standard and the quality of the questionnaire is never compromised to collect the data across countries. The outcome variable in the present study was fertility level, consisting of two categories (a) low fertility and (b) high fertility. The covariates used in the study include age at first marriage. Moderator variable per capita health expenditure per capita (current US$) were considered to conduct meta-regression which is the sum of public and private health expenditures as a ratio of total population. It covers the health services (preventive and curative), contraception activities, nutrition activities, and emergency aid designated for health. We collected data for the corresponding year of the DHS countries from World Bank development indicators.

2.2. Meta-analysis

To reach a conclusion about the fertility of developing countries

![Forest plot presenting odds ratios of high fertility for age at first marriage.](image-url)
accounted for age at first marriage, the researcher has used meta-analysis which is known as a method of summarizing the findings. Estimation of OR was possible using statistical software R for 15 DHS data. Due to the different circumstances of the countries, researchers went with the random effect meta-analysis. We have used the package ‘meta’ in R to perform the meta-analysis correctly.

2.3. Subgroup analysis

Subgroup analysis has been included for investigating some additional factors that can explain between countries heterogeneity. Statistical software R with the help of package ‘meta’ subgroup analysis has taken part.

2.4. Meta-regression

In our meta-regression analysis, an individual country was used as the unit of analysis, and the outcomes were the logarithms of the ORs of fertility level in the 15 countries in which DHS were conducted. Meta-regression was performed using statistical software R and ‘metafor’ package was utilized.

3. Results

Table 1 bears the characteristics of the sample that is utilized to make the study come to light. It is seen that, among all the countries, Bangladesh has most of the marriage before age 18. On the contrary, Albania manages the age at first marriage to be 18 and above for most of the cases.

Findings of meta-analysis using 15 different countries DHS data is displayed in Table 2. We considered age at first marriage 18 and above to be treatment group and age below 18 as our control group. For our treatment, we have found the estimated pooled OR is less than 1 for the event high fertility. This finding indicates if first marriage is done after 18 or at 18 it has 0.46 times less chance to contribute to high fertility than when marriage is done before 18. Table 2 also consists of the 95% confidence interval for the pooled OR. From the pooled OR we can conclude that the result is statistically significant as there is no overlapping of the confidence interval with 1. It is also found that a statistically significant heterogeneity test also exists with the observed heterogeneity.
The meta-regression analysis for the variable ‘Age at First Marriage’ indicates a significant heterogeneity, with $Q^2 = 779.80$ (p-value < 0.01), suggesting that the total amount of heterogeneity is accounted for per capita health expenditure alone. The estimated meta-regression equation can be written as:

$$\log(OR) = -0.2019 - (0.0008 \times PCHE)$$

Findings from meta-regression have shown that the moderator variable per capita health expenditure alone can explain 58.07% of the fertility behavior for variable age at first marriage.

In Fig. 3, each study is represented by a circle that shows the actual per capita health expenditure for that study. The size (specifically the area) of each circle is proportional to that study’s weight in the analysis. The thicker line shows the predicted values and the dotted line shows the 95% CI.

The meta-regression plot (bubble-plot) infers that the higher the health expenditure per capita lowers the fertility performance.

### 4. Discussion

The analysis shows that the factor age at first marriage appeared to have a great influence on fertility behavior in developing countries. When age at first marriage is low such as before 18, it leads to increase in the number and children and overall fertility condition which are consistent with some earlier studies. The combined effect of age at first marriage appeared to influence on fertility behavior in developing countries.

From Tables 4 and 5 we found that, the estimated total amount of heterogeneity is 0.0384 and percentage of the total amount of variability due to heterogeneity is 97.08%. Furthermore, the test of heterogeneity is statistically significant since $Q = 332.2637$ with DF = 14 and p-value < 0.0001. The estimated value of the overall effect size is $-0.3161$, which is also statistically significant since p-value < 0.0001.

To explain the extra-heterogeneity, we used different moderators such as per capita health expenditure (PCHE), Gross Domestic Product (GDP) and annual population growth (APG). Among three moderators, PCHE is capable to explain the heterogeneity significantly at 5% level of significance.

From the above table, we have found that the test for residual heterogeneity ($\hat{Q} = 196.1251$) is still statistically significant at 5% level of significance with $df = 13$ and p-value = < 0.0001. But the estimated between-study variance dropped to 0.0161 from the previously estimated variance of 0.0384. Thus $0.0384 - 0.0161)/0.0384 = 58.07\%$ of the total amount of heterogeneity is accounted for per capita health expenditure alone. The estimated meta-regression equation can be written as:

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5. Conclusion

Available evidence suggests that age at first marriage is an important factor which implies lower fertility with rising age at first marriage. When age at first marriage is high the duration of marriage life is low, leads to fertility decline. This study suggests the policymaker and government of developing countries with over or high fertility take necessary steps to prohibit adolescent and early marriage for gaining the expected fertility. Policymakers of Asian developing countries suffering form over fertility should develop such situations to entertain age at first marriage to be 18 or above. Additionally we conclude that, per capita health expenditure of a country should be increased for countries with over or high fertility. This is an important factor that has impact on fertility performance and strong evidence to explain the heterogeneity in fertility behavior of developing countries.

Ethical approval

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Declaration of competing interest

The authors have no conflicts of interest to declare.

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