Impact of socio-economic status on ovarian reserve markers

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ABSTRACT

BACKGROUND: Fertility rates have started declining in India in the last few decades. The total fertility rate, which was 3.5 in 93-94 declined to 2.5 in 2005-6. Researchers attribute this fertility transition to concomitant socio-economic development. Decreasing ovarian reserve is an important contributor for age related infertility. **OBJECTIVES:** The objective of this study was to assess the association of ovarian reserve with socio-economic status (SES) with the available clinical ovarian reserve markers in reproductive age women. **MATERIALS AND METHODS:** A total of 160 married women in the age group of 20-35 years, belonging to all three socio-economic strata were assessed for ovarian reserve using the clinical ovarian reserve parameters Antimullerian hormone (AMH), Antral follicle count (AFC) and follicular stimulating hormone (FSH). Analysis of variance was used to see the association of ovarian reserve with SES. **RESULTS:** Both the ovarian parameters AMH and AFC have shown a significant association with SES ($P = 0.000$ for AMH and $P = 0.023$ for AFC). The association between FSH and SES was not significant ($P = 0.147$). **CONCLUSIONS:** Higher SES in this study was seen to be associated with better ovarian reserve as assessed by the available clinical ovarian reserve markers.

KEY WORDS: Fertility rates, ovarian reserve, socioeconomic status

INTRODUCTION

Fertility transition in India in the last few decades was attributed to socio-economic development. The total number of people living below the poverty line in India was 36% in 93-94 and 22% in 2005-6. During the same period total fertility rate declined from 3.5 to 2.9.[1,2] Socio-economic status (SES) is an important social determinant that influences reproductive health behavior of individuals in many ways. According to social scientists socioeconomic variables like female literacy, per capita income and employment status, age at marriage, life expectancy and low infant mortality rates are associated with declining fertility rates. Age at marriage and contraceptive acceptance rates were found to be higher among educated women that too particularly urban women. Education has been found to increase women's levels of autonomy in decision-making, in acquiring knowledge, in gaining access to economic resources, and in interacting with a wider social circle. It is through this autonomy education exerts an impact on fertility.[3-5] Selected socio-economic characteristics, such as caste, religion and region were also found to have influence on fertility levels.

Kuppuswamy's SES scale is an important research tool for measuring SES of urban communities and includes education, occupation and family income of individuals.[6] On the basis of Kuppuswamy's, SES scale individuals can be divided into three socio-economic strata. Individuals with a score of 10 or less represent low SES, those with a score between 11 and 25 represent middle SES and those above the score of 25 represent the higher SES. Few studies in the medical literature emphasize on the social correlates of fertility.[1,2,7]

The age related decline in fertility rates is predominantly due to reduced ovarian reserve. The ovarian follicle pool and the quality of oocytes constitute what is called ovarian reserve. Ovarian reserve markers are used to estimate the reproductive health status of women at a given age. Follicular stimulating hormone (FSH), Antimullerian hormone (AMH) and Antral follicle

count (AFC) are commonly used ovarian reserve markers for assessing ovarian reserve in women of reproductive age. Ovarian reserve markers also provide assistance in selecting the appropriate protocol and/or initial dose of gonadotropin in infertility practice.[8,9] It is not known whether there is any association between SES and ovarian reserve though both the factors influence fertility rates. There are few studies available in literature, which throws light on the impact of SES on ovarian reserve markers. Hence, the objective of this study was to assess the association between ovarian reserve and SES with the available clinical ovarian reserve markers in women of reproductive age.

MATERIALS AND METHODS

This observational cross-sectional study includes 160 married women in the age group of 20-35 years who attended the Gynecology department of a tertiary care teaching hospital from January 2011 to December 2012 and who satisfied the inclusion criteria.

Inclusion criteria

Healthy women with normal menstrual cycles (25-35 days).

Exclusion criteria

Subjects using hormonal contraceptives, smokers, pregnant and lactating mothers and those who underwent hysterectomy, oophorectomy, ovarian cystectomy, fulguration and cases of endometriosis were excluded from the study. Subjects with polycystic ovary syndrome, diabetes mellitus and thyroid disorders were also excluded from the study.

Written informed consent was obtained from all the participants and institutional ethics review committee approval was obtained before commencing the study. Study subjects were divided into three socio-economic groups according to Kuppuswamy's SES scale. There were 52 subjects each in low and middle SES and 56 subjects in the high SES. On days 3-6 of the menstrual cycle 10 ml of blood was collected from the participants for estimation of FSH and AMH. Serum FSH was measured using a specific immumetric assay kit (Immulite; Diagnostic products corporation, Los Angeles CA, USA). Measurement of serum AMH levels was performed using AMH/Müllerian-inhibiting substance Elisa kit (Diagnostic systems Lab, Webster Texas, USA). On the same day, transvaginal ultrasound examination was carried out to count the number of antral follicles (AFC) between 2 and 6 mm in both the ovaries. FSH, AMH levels and AFCs were compared in all the three socio-economic groups. Statistical analyses were performed using SPSS software version-16 (SPSS Software trail version 16 IBM). Analysis of variance was used for comparing the groups. For all statistical analyses $P < 0.05$ was considered to be statistically significant.

RESULTS

A total of 160 subjects belonging to all three socio-economic strata were analyzed. Subjects in the low SES had a mean age of 24.6, middle SES 25.04 and high SES 24.54 years. The mean body mass index (BMI) for low SES was 21.6; middle SES 22.33 and high SES 22.66 kg/m^2. Subjects in all the groups were more or less identical in age and BMI. Both the ovarian parameters, AMH and AFC have shown a significant association with SES ($P = 0.000$ for AMH and $P = 0.023$ for AFC). The association between FSH and SES was not significant (P = 0.147) [Table 1].

DISCUSSION

According to WHO estimates about 13-19 million people are likely to be infertile in India at any given time. A number of studies have shown varying levels of infertility among different socio-economic sub-groups of women. Socio-economic development is not uniform across all regions of the country and recent studies in India show that permanent childlessness in urban areas has increased more rapidly compared with the rural areas.[10,11] This study was conducted to assess whether there exists any association between ovarian reserve and SES. The observations made in this study reveal significant associations between higher SES and ovarian reserve as assessed by the available clinical ovarian markers. Of the three ovarian reserve parameters measured AMH and AFC have shown significant associations with SES. Moreover AMH, shows little inter cycle variability and day of testing does not interfere with the test results. Interpretation of AFC may be observer dependent and can be eliminated by automated evaluation of the antral follicle size and number. In case of FSH the association was not significant. FSH along with estradiol (E2) levels on day 3 or 4 are better markers than FSH alone but Estradiol was not included as a study parameter in this study. Moreover day 6 FSH could be falsely low as follicular selection toward dominance may already be initiated. These limitations could be an important reason for the lack of association of FSH with ovarian reserve as with other markers such as AMH and AFC.

The low fertility rates with higher SES can be explained by the fact that people in higher socio-economic strata have better accessibility to health-care and control over their reproductive health compared with people in lower socio-economic strata. One more reason for lower fertility rates with improving SES might be higher mean age at

Table 1: Comparison of ovarian reserve markers in different socioeconomic groups

Study parameters	*N*	Mean	Standard deviation	95% confidence interval for mean		*P* value
				Lower bound	Upper bound	
Age (years)						
LSE	52	24.60	4.16	23.44	25.75	0.738
MSE	52	25.04	4.11	23.90	26.18	
HSE	56	24.54	2.4	23.89	25.18	
BMI (kg/m^2)						
LSE	52	21.60	3.05	20.75	22.45	0.199
MSE	52	22.33	3.03	21.49	23.18	
HSE	56	22.66	3.27	21.78	23.54	
AMH (ng/ml)						
LSE	52	2.28	1.89	1.73	2.78	0.000*
MSE	52	2.94	1.81	2.44	3.45	
HSE	56	3.94	2.08	3.38	4.49	
FSH (IU/L)						
LSE	52	9.57	6.59	7.74	11.40	0.147
MSE	52	9.06	6.74	7.18	10.94	
HSE	56	7.50	2.49	6.88	8.22	
AFC						
LSE	52	7.87	2.01	7.31	8.42	0.023*
MSE	52	8.31	2.40	7.64	8.98	
HSE	56	9.04	2.20	8.44	9.63	

LSE=Lower socioeconomic status; MSE=Middle socioeconomic status; HSE=Higher socioeconomic status; BMI=Body mass index; AMH=Antimullerian hormone; FSH=Follicular stimulating hormone; AFC=Antral follicle count.*Statistically significant (*P*<0.05) changes were seen in AMH levels and AFC

marriage and better awareness about family planning measures.[12-17] Education and family income were the most important determinants of fertility rates in India as seen in National Health Family Survey-3. Moreover, the unmet need for family planning was also high In lower SES.[7,18] The Inference drawn from this study was that higher SES is seen to be associated with better ovarian reserve as measured by the available ovarian reserve markers. This improvement in ovarian reserve was not reflected in fertility rates as this effect is negated by the other dimensions of the improved SES. This study included only limited number of subjects and more studies involving a larger number of subjects are required to determine the impact of SES on ovarian reserve.

CONCLUSION

SES is an important determinant of reproductive health status and behavior of individuals. Higher SES in this study was seen to be associated with better ovarian reserve as assessed by the available clinical ovarian reserve markers.

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