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Micro Determinants of Human Fertility: Study of Selected Physiological and Behavioural Variables in SC and ST Population

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Abstract

This paper is an attempt to study plausible causal relationship of women's physiology and behaviour components with fertility in more or less non-industrial rural populations in Orissa, an Eastern Indian state. The primary data for this study has been collected through a survey conducted among the SC (SC) and ST (ST) population in Orissa. From the bivariate and multivariate (MCA) analysis of selected physiological factors it was observed that the fecundity variable like higher 'average number of years used for child bearing' emerged as an important predictor of lower fertility (except for SC women). Although variables like the length of menstrual cycle beyond optimum, ANC not received for last delivery and age at menarche more than 12 years were found to reduce fertility, these phenomena were not very consistent when adjusted for other confounding factors. The behavioural factors of women such as higher desired family size and longer perceived ideal birth interval have been consistently associated with lower fertility. For SC population, the association of woman's correct knowledge about probable days of conception within menstrual cycle, with lower fertility gives impression that proper knowledge may provide chance to women or couples to adopt some kind of fertility control mechanism. The verbatim and incidents presented in this paper imply that on one hand the child survival is at demand and on the other, there seem to have a need for access to controlled and intended fertility.

JEL Classification : ***I12, J13***

Keywords : ***Fecundity; Menarche; Desired family size; Qualitative information; Verbatim; Orissa***

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1. Introduction and Literature Review

Majority of events in the process of human fertility operates within a biological framework. Many of the factors manifest directly through the body physiology of human beings. The factors, which are behavioural by origin and physiological in function, have been the interest of many demographers. Both at individual as well as population level, there are a number of small factors, which may affect the human fertility in differential magnitude can be considered as the 'micro determinants'. This is an area of fertility research that has recently got utmost interest by demographers; social scientists and medical researchers like Nag, Bongaarts and Clarke.

Fertility in its biological process is the function of various phases such as production of gonads, successful union and fertilisation of sperm and ovum, embryo formation, implantation, successful gestation and delivery of a live birth. Each phase is affected by different factors designing the fertility and the impact may be individual or interactive (additive) in nature. There have been studies by demographers and medical researchers on impact of some physiological factors on fertility. Pandey (1989) in his study in Jabalpur found the lower fecundibility and lower proportion of fecund women among tribals than non-tribals are responsible for lower fertility of tribals. In separate studies, Bongaarts (1986) on 'Kungs' fertility; Randal (1996) on two non-industrial societies of Mali, and Gray (1977) have found various diseases like malaria, venereal syphilis, gonorrhoea, genital tuberculosis and other sexually transmitted infections (STIs) and reproductive tract infections (RTIs) affecting the fecundity and thereby fertility. They also inferred the same health problems affecting fertility indirectly through prolonged spouse separation.

Das (1979) has examined the lower level of fecundity of Juang tribes of Orissa and concluded that malnutrition, environmental factors and biological factors are

responsible for this. The non-physiological factors have also been found to be responsible for differential fertility by many demographers and medical researchers. Arokiaswamy (1997) in his study has endeavoured to examine the effect of poverty and nutrition on fertility; to disentangle the linked effect of poverty and nutrition on fertility; to explain the causal dynamics; and to examine the different characteristics of the rich and poor families, and acceptors and non-acceptors of contraception. He observed that nutritional status of women had a negative impact on fertility for urban women aged over 35 years with no child loss. At the same time he observed that fertility was lower among undernourished women and was affected directly and indirectly by marriage age; by contraceptive prevalence and breast-feeding as proximate variable; by poverty, child mortality, and nutritional status as intervening variables; and by education and occupation as background variables.

Mascie Tylor (1992) in a study showed that diseases other than sexually transmitted diseases (STDs), *viz.*, malaria, tuberculosis (TB), anaemia and leprosy can reduce fertility through different mechanisms like oligospermia, foetal mortality and menstrual disorders. Brasel (1978); Tyson et al. (1978); Bongaarts (1986) and Zachariah (1996) have explained the effect of maternal nutrition on fertility through various mechanisms like function of reproductive endocrine system; duration, pattern and intensity of lactation affecting the post-partum amenorrhoea (PPA); weight gain and delay of menarche etc. Clarke and Cumley (1962) explored the fact that the endocrinal disturbances may affect reproduction at any of the various stages- maturation of egg, growth of lining of uterus and so implantation of fertilised egg or malformation of foetus ending with abortion or stillbirth. Ellison (1990) in another study showed that late reproductive maturation is associated with lower level of ovarian function in adulthood.

Since many of the human behaviours affect the actual practice regarding its fertility and even the biology of fertility, behavioural factors have been considered important in fertility research. In addition to their role as background factors, these have also been recognised as intermediate (Davis and Blake, 1956) factors of fertility and a few even have perceived as proximate determinants of human fertility (Bongaarts, 1993).

Specific factors like knowledge and attitude have often been identified as key determinants of human fertility. It has been felt important to find out the stages at which fertility attitudes are first formed and process through which attitudes

crystallise into a definite desire to limit family size, by carrying out micro level studies (Mari Bhat, 1993). The knowledge, attitude and practice of women as well as men directly or indirectly influence fertility. Again, these are affected by background factors like socio-economic background, external intervention (program factors, culture contact) etc.

There have been some studies on impact of behavioural factors on human fertility. Pillane and Ryser (1975) in a study on fertility knowledge, attitude and practice of males in Pittsburgh inferred that there is a strong association between parity and males' desired family size. They found that with the increase in age and marital duration, the parity and desired family size increases. Unger and Molina (1999) in a study on Latin women of Los Angeles observed that the desired family size was associated with current family size even after controlling the effect of confounding factors in multivariate analysis. They also identified that the number of sons was positively associated with fertility.

Naik and Sharma (1985) have carried out a case study on social structure and family planning behaviour in two tribal villages of Orissa. They understood that money appears to be the main incentive for the tribal people in adopting sterilisation. They suggested to impart proper information, education, motivation, and to provide the full range of family planning methods, since there appears to be good scope for family planning acceptance. Pathak and Pandey (1993) analysed the tempo of fertility in Orissa, based on birth intervals. They inferred that urban couples are more likely to use contraception; and increasing the age at marriage and promotion of education of females are necessary to convince couples for accepting small family norm.

Bose (1988) in his secondary analysis of Census data along with other available data of 1970s and 1980s attributed various factors for stagnation of tribal population in Orissa. These are poverty stricken out-migration, under-nutrition, high mortality, fall in fecundity and above all under-enumeration. He observed a higher level of infant and child mortality during the 1972-1978. The higher level of family planning performance among tribals seems unexplained against the backdrop of poverty, under-nutrition and malnutrition, and higher infant and child deaths. Stein and Susser (1978); Dyson (1991) have shown impact of famine on the individual as well as group fertility. This acts through mechanisms such as separation factors and psychological factors leading to less coital frequency, more abstinence etc.,

and poor nutrition leads to still birth and abortion.
Thiagarajan (1990) in his study on fertility and family planning behaviour of male school teachers could explore some of the determinants of fertility. He found child loss, perceived ideal family size and sex composition of children consistently and positively associated with fertility. Use of family planning methods showed negative association with fertility.

Against these backdrops the current paper examines the nature and magnitude of association of selected physiological and behavioural characteristics of women with fertility.

2. Methodology

2.1 Sources of Data

For this study, primary data were collected from `Angul' district of Orissa, which has a relatively higher proportion of Scheduled Caste[1] (SC) and Scheduled Tribe (ST) population. Currently married women in the age group of 13 to 49 years were chosen as the respondents. A total of 600 such women, 300 each from SCs and STs were interviewed in the sample survey. Besides quantitative data, qualitative information on fertility preference, perception and practice regarding health and particularly on reproductive morbidity, conception period were collected. Data collection was carried out during the year 1997-1998.

All analyses in this paper have been carried out separately for SC, ST as well as all women (pooled data). An ANOVA test has been carried out along with bivariate descriptive analysis of fertility level by different background as well as intermediate characteristics to examine the differential in variance. To find out the sole effect of each of the intermediate factors, controlling for other confounding factors (both independent variables and covariates), and categorical variation in

[1] The variables 'SC' used in the present paper are subdivision of 'caste'. Caste is an age-old categorisation of people particularly in Hindu society based on occupation. SC and ST are two such categorisation, which has been mainly defined by the constitution of India afresh after the year 1956 according to special directive of the President of India. These two groups are often comparatively at a very low level of socio-economic development than rest group of people in the society. STs are the tribal aborigines.

fertility, the multiple classification analyses (MCA) were undertaken.

2.2 Definition and Conceptualization of Physiological Variables

For the study of some other selected physiological factors of women, the variables such as open birth interval, age at menarche, length of menstrual cycle, woman's age at last delivery, mental strain, ante-natal care (ANC) at last pregnancy, use of family planning (FP) methods, average number of years used for child bearing have been used. Some of the constructed variables like average number of years used for child bearing (AYCB), reproductive duration and open birth interval were standardized by the age at sterilization and age at menopause in case of the sterilized and menopause women. AYCB has been constructed as total reproductive duration divided by total number of conceptions. The two variables such as open birth interval and AYCB, standardised for age at sterilisation and menopause have been analysed here as fecundity variables. Increase in these values indicates the declined level of fecundity.

Age at menarche is one of the physiological factors having significant bearing on fecundity and fertility. Lower age at menarche is often associated with a better nutritional status and a higher age at menopause, therefore, leading to longer biological reproductive span. The lower age at menarche reflects a healthy reproductive physiology, which favours higher level of fecundity and fecundibility. Late reproductive maturation is associated with lower level of ovarian function in adulthood. In cultural domain the age at menarche has positive relationship with age at marriage and negative association with the actual reproductive span. In this way age at menarche can have negative association with fertility. Length of menstrual cycle, which also has bearing on fertility, is found to fluctuate due to change in endocrinal function.

The endocrine system plays an important role in the reproductive cycle of women and any disturbance of the endocrinal balance may lead to abnormalities in reproductive function. Endocrinal disturbances may affect reproduction at any of the various stages- maturation of egg, growth of lining of uterus and so implantation of fertilised egg or malformation of foetus ending with abortion or still birth (Clarke and Cumley, 1962). A cycle lower and higher than a normal period can have negative impact on fertility. Mental strain can also hinder the endocrinal function and decline fertility. During strain, the sexual and reproductive environment is often not

conducive enough for fertilisation. This can have behavioural effect in a way that it may decrease frequency of coitus necessary for successful conception. Use of family planning is a direct factor affecting fertility. Antenatal care can affect the successful gestation and fate of pregnancy outcome.

Age at marriage of woman and man can have biological effect on fertility. At extreme lower and higher ages, the reproduction probability decreases due to various reasons. Often, at lower ages the gonads are not sufficiently matured, the menstrual cycles are not regular (amenorrhoea), anovulatory or with less viable ova leading to lower probability of conception. Higher age at marriage is associated with higher age at childbearing when the fecundity starts declining due to structural and functional changes in gonads. Age at marriage can have negative effect on fertility in other pathways such as, at lower age women and even men have lesser access to fertility decision and regulation due to inadequate knowledge and intervention of other family or community members.

2.3 Definition and Conceptualization of Behavioural Variables

To study the behavioural factors of fertility, specific information has been elicited on women's perception about ideal and desired family size, birth interval and sex composition of the children, knowledge about family planning methods and probable period of conception within a menstrual cycle and fertility decision-making.

The variables mentioned above have been analysed from the direct questions of the women's questionnaire and some were rated. All currently married women irrespective of children ever born (also infertile) have been considered for analysis. All variables in the analyses are current perception of the women except for the desired family size, which has been asked in the context of their beginning of family building process, that is 'just after marriage'.

The perception regarding ideal family size and ideal birth interval and about probable period of conception within a menstrual cycle is often affected by the cultural values prevailing in the society or locality, and therefore, these have impact on fertility. Even the knowledge and use of family planning methods, which are proximate determinants of fertility is someway or the other, designed by individual perception and cultural folkways. The ideal and desired family size, and number

of sons are positively related to fertility. The ideal and desired number of daughter may have positive, negative or neutral association with fertility, since in a society where specific son preference is relatively lower, the desired number of daughter may increase fertility. The ideal and desired birth intervals are negatively associated with fertility.

Knowledge about family planning methods and probable conception period also influence women's fertility regulation behaviour. At the same time, the accessibility to fertility decision-making is important regarding the intended fertility. In a patriarchal set-up, husband's characteristics makes considerable difference to the family level decision and hence the fertility. Some other behavioural variables such as, desired family size is positively related to fertility and desired birth intervals are negatively associated with fertility. The attitude regarding fertility regulation can affect the fertility control and therefore, the fertility.

2.4 Limitations of Data

An inherent limitation in the study of fertility perception is that the responses are to some extent affected by the environment, socio-economic and psychological condition of the respondent at the time of survey. Possible influence of personal bias cannot be ruled out. Therefore, the response may vary in time and space. Lesthaeghe et al. (1981) even have referred these responses as ‘rather slippery pieces of information’.

In some societies the very idea of individual control over fertility may be foreign leading many respondents to answer that family size is ‘up to God’ or such similar response. In these circumstances a numerical estimate of desired size, even if obtained, may have little meaning. In spite of potential difficulties, the expressed desired family size in Third World countries is often compared with current fertility level. A desired size significantly below current levels is commonly taken as indicative of a latent desire for greater availability of facilities for family planning (Pressat and Wilson, 1985).

3. Analyses and Discussion

3.1 Physiological Factors Affecting Fertility

3.1.1 General Physiological Characteristics of the Sample Women

Table 1 shows the percentage distribution of the women distributed by selected physiological characteristics. By current age, 12 percent of all currently married women were in teenage, 60 percent were in middle age group of 20-34 years and 27 percent were in the age group of 35 years or above. Compared to STs, more SC women were in their teenage and middle age group. The distribution of women categorised by open birth interval (BI) standardised for age at menopause and sterilisation showed that 20 percent of women had given birth more than 5 years back. Around 56 percent of women had given birth less than 2 years back.

Frequency distribution of women by age at last delivery showed that 21 percent of women delivered at least one pregnancy during their teenage and 6 percent of women delivered below 17 years of age which are physiologically hazardous to mother's health. About twenty-two percent of all women delivered their last pregnancy outcome at the age of 30 years or more. Of them, more than 7 percent of women had delivered at more than 36 years of age, which is also considered as high-risk fertility behaviour by age (NFHS, 1995). ST women are more in both categories than SC women. Another matter of risk is, 64 percent of expectant mothers for last pregnancy didn't receive any antenatal care (ANC) that is no tetanus toxoide (TT) vaccine or iron folic acid (IFA) tablets. Ten percent got this at doorstep from the ANMs (auxiliary nurse midwives).

It was found that more than one-third of all women on an average had used 4 years or more for childbearing and around 32 percent of women used less than 2 years. Regarding the family planning use, 19 percent of all women reported to be using any family planning method. Compared to STs, a marginally higher proportion of all SC women reported to use any family planning method. About 15 percent of all women and comparatively higher proportion of SC women reported to have more mental strain in their marital life.

Table 2 presents the mean value of some of the physiological variables observed. The mean age at marriage of women is found to be quite low. Age at last delivery was found comparatively lower in case of the SC women than ST women. Even, reproductive duration and marital duration were lower for SC

women compared to the ST women.

3.1.2 Bivariate Analysis

Table 3 gives the breakdown of average children ever born (CEB) by physiological variables. The average CEB, as expected, increased with the current age of the women. It was found that the fertility has been higher for women having more regular menstrual cycles of length 28-31 days. Beyond these limits, women recorded lower level of fertility. It was found that the above-mentioned trend by length of menstrual cycle is statistically significant in the middle age group women, *i.e.*, 20-34 years. The open birth interval and age at last delivery showed significant increasing trend in CEB, both in SC as well as ST women. This is also significant for all women. This was more consistent in higher age group women, *i.e.*, 35 years and above. The variable 'average number of years used for child bearing (AYCB)', which is considered as a fecundity variable did not show consistent variation in CEB. For women who used an average of 2-3 years towards child bearing, the mean CEB was found higher.

For the women who didn't get any ANC, the fertility was found to be lowest. Fertility level was found to be highest for the women who got ANC from ANMs at their doorsteps (home). The women who used any family planning method were found to have higher fertility than those not using. This may be due to the facts that majority of the family planning users have adopted sterilisation method most likely after achieving their desired family size. Average CEB was found slightly higher for women, who reported more mental strain in marital life but the difference was not found to be significant.

3.1.3 Multivariate Analysis

To study the nature and magnitude of association of different physiological factors with the fertility, multiple classification analyses were carried out taking CEB as dependent variable, selected physiological variables as independent variables and woman's current age and marital duration as covariates. The result gives the sole effect of each physiological factor on fertility when the effect of other confounding (intermediate) factors is controlled.

Table 4 shows the result of MCA for selected physiological variables for all women.

The grand mean CEB was found to be 2.80. The multiple R^2 was only 0.192 when only independent variables were included and it increased to 0.484 when the covariates were also incorporated. This means, all the independent predictors together could explain only 19.2 percent of the variation in the dependent variable CEB, whereas, the independent variables along with the covariates could explain 48.4 percent of the variation in CEB. The covariates taken in this analysis are the factors, which often have direct effect on fertility. Hence, the inclusion of these two variables is considered necessary. In practice, after their influence was controlled the sole effect of other independent variables emerged out to be more clear.

The unadjusted deviation of category mean from the grand mean CEB is shown in column 3 of Table 4. AYCB was found to be the most important predictor variable affecting the fertility (CEB) since the deviation by category means was highest for this variable. Eta value (column 4) was also highest for this variable. After adjusting for other independent variables, category means (column 5) for AYCB showed a little variation. Beta value (column 6) however, did not show any difference. When adjusted for other independents as well as covariates, category means changed. Category mean CEB was found to be lower for women having more than 4 'average number of years used for child bearing' depicting a lower level of fecundity. 'Length of menstrual cycle beyond optimum[2] and 'ANC not received for last delivery' showed decline in category mean CEB both before and after adjusting for the independents and covariates. The magnitude of effect (Eta and Beta values) however showed some variation. Age at menarche more than 12 years showed decline in fertility before adjustment. However, after adjusting for independents and covariates the result was different. This implies, there was a significant influence of other factors (independents and covariates) in the case of above association. . However, the variation was very small and insignificant.

Table 5 shows the result of MCA for selected physiological variables for SC women. The grand mean CEB was found to be 2.82. The multiple R^2 showed that all independent predictors together could explain only 12.8 percent of the variation in the dependent variable CEB, whereas the independent variables along with the covariates could explain 50.6 percent of the variation.

AYCB was found to be the most important predictor affecting the fertility (CEB) since

[2] Optimum period of Healthy Menstrual cycle is 28-31 days: Clarke and Cumley, 1962.

the deviation by category means was highest. It was observed that the Eta value for this variable was also highest. However, after adjusting for other independent variables category means for these variables changed. Beta value too showed considerable variation. Mean CEB was found to be lower for women in the category of more than 4 years of average period used for child bearing. This reflects lower level of fecundity. When adjusted for other independents as well as covariates, category means as well as the relationship changed. This implies, the covariates influence the negative association of AYCB with fertility. Length of menstrual cycle beyond optimum and ANC not received for last delivery show decline in category mean CEB both before and after adjusting for the independents and covariates. The effects (Eta and Beta values) also showed variation. Age at menarche less than 13 years brought about slight decline in fertility only after adjustment.

The results of MCA of selected physiological variables for ST women are presented in Table 6. The fertility depicted by the grand mean CEB was found to be 2.77. The multiple R^2 was only 0.280 when all independent variables were included and it increased to 0.492 when the covariates were also included. This implies, all the independent predictors together could explain 28 percent of the variation in the dependent variable CEB, whereas the independent variables along with the covariates could explain 49.2 percent of the variation in CEB. This increase justifies the inclusion of covariates such as woman's age and marital duration.

The unadjusted deviation of category mean from the grand mean CEB is shown in column 3 of Table 6. AYCB and length of menstrual cycle were found to be the most important predictors of fertility (CEB), as the deviations by category means were higher. Eta values were also highest for these variables. After adjusting for other independent variables, category means and beta values for these variables showed a little change. However, after adjusting for other independents as well as covariates, category means and beta values showed more deviation. The mean CEB for the women with menstrual cycle beyond optimum periods, was lower than those who had 28 to 31 days cycles. AYCB did not show consistent trend in fertility. Mean CEB were lower for women in lowest (less than 2 years) and highest (more than 3 years) categories of AYCB.

After adjustment for the independent variables and covariates, ANC not received for last delivery showed considerable decline in category mean CEB, and the effect (Eta and Beta values) showed variation. Age at menarche more than 12 years

showed decline in fertility before adjustment. However, after adjusting for independents and covariates the effect narrowed down, which means that in the former case the influence of other factors were there.

3.2 Women's Behavioural (Perception) Factors and Fertility

3.2.1 Behavioural Characteristics of the Sample Women

Table 7 shows that around 27 percent of all women feel a family size of 4 or more children to be an ideal condition and 10 percent could not report a specific number to this question. However, a little higher proportion of ST women as compared to SC women (28 per cent vs. 26 per cent) perceived a family size of 4 or more children to be ideal. Majority (60 percent) of the sample women perceived an interval of 2-3 years between subsequent births to be ideal. SC women in this regard were less in proportion than STs. Even twenty percent of all women perceived a birth interval of 4 years or more as ideal. A higher proportion of SC women fall into this category. It was again found that overall 40 percent and relatively more in the case of SC women (65 % SC versus 55 % ST), perceived an interval of more than one year between marriage and the first birth to be an ideal condition. Nineteen percent of all women could not report any specific period regarding this.

By sex composition of the children, it was found that 44 percent of all women perceived two sons to be an ideal composition and 11 percent reported more than 3 sons in the completed family to be an ideal situation. Compared to SC women, higher proportion of ST women perceived more sons in a family to be the ideal condition. Similar responses were observed regarding the desired number of sons at the beginning of family building process. Forty-two percent overall and again comparatively more ST women reported that they desired 2 or more sons at the beginning of family building process.

With regard to the access to fertility decision-making, 77 percent of all and comparatively higher proportion of ST women reported to take part in fertility decision. Eighty-four percent of all women reported to have some knowledge on contraceptives. Only 9 percent of all women reported more or less correct probable period (days) of conception within the menstrual cycle of a woman. Comparatively a little more ST women were found to have knowledge on both

these aspects.

Table 8 gives a quick assessment of differentials in the ideal, desired and actual family size of the women and also their husbands. The reported desired family size of both husband and wife was found to be lower than the actual number of surviving children. This is again marginally lower than actual CEB and reported ideal family size. Comparatively, more ST women reported larger ideal and desired family size than SC women, but in practice their fertility level is slightly lower than the later.

3.2.2 Bivariate Analysis

Table 9 presents average actual fertility (mean CEB) across behavioural factors of the women. The women who perceived a larger family size to be an ideal condition were found to have higher fertility. This association persisted to be more significant in the middle age group women who belonged to ST. Negative association of fertility with the women's perceived birth interval consistently emerged from the bivariate analysis. Higher level of fertility was observed for the women who could take part in the fertility decision-making. This may be a result of the reverse causation and probably because women at higher ages with more children have better access to decision making in the household. Negative association was observed between the fertility and the correct knowledge of women about the probable period of conception in the menstrual cycle. But, in case of SC women, 'knowledge about the most probable period of conception' showed a positive association with CEB.

Women who had some knowledge of family planning methods were found to have significantly higher fertility. In case of the ST women we observed a higher magnitude of variation. It was found that fertility tends to increase with the women's perceived ideal and desired number of sons and total children. This phenomenon was more significant in middle age group women.

3.2.3 Multivariate Analysis

To understand the causal relationship of the behavioural factors of women with fertility, multiple classification analyses (MCA) were undertaken considering children ever born (CEB) as dependent variable, and women's selected

behavioural variables along with the background factors as independent variables. Results show the sole effect of each factor on fertility, when the influences of other confounding (intermediate) factors are controlled. Woman's current age and marital duration were taken as covariates.

Result of MCA for behavioural characteristics for all (SC and ST) women are shown in table 10. For the pooled data (all women) the grand mean CEB was found to be 2.80. The multiple R^2 of the MCA indicates that all independent predictors together could explain only about 6 percent of the variation in CEB, whereas, the independent variables along with the covariates could explain about 35 percent of the variation. This improvement in the overall variation in response variable shows the necessity to include covariates such as woman's age and marital duration to know the real effect of the predictors after controlling effect of covariates.

Desired family size just after marriage and ideal family size of the women emerged as most important predictors of fertility (CEB), as the deviation by category means were found to be higher (see table 10). Eta values were also higher for these variables. Category means for desired family size remained almost same, even after adjustment for other independent variables. Beta value too did not show much difference. However, when adjusted for other independents as well as covariates, category means and beta value for ideal family size showed drastic change. Higher fertility was observed for the women whose reported desired (at the beginning of family building) as well as ideal family size was higher, as category mean for these variables increased to 2.87 and 2.83 respectively. Thus, it showed that the real effect of desired family size and ideal family size of the women were to raise the fertility.

Perceived ideal birth interval of 2 to 3 years shows decline in category mean CEB both before and after adjusting for the independents and covariates. Proper knowledge of women about probable conception days in a menstrual cycle did not show any significant change in fertility after adjusting for independents and covariates. However, marginal decline in fertility was observed before adjustment.

Table 11 shows the result of MCA for behavioural characteristics for SC women. The grand mean CEB was found to be 2.82. The multiple R^2 was only 0.081 when the independent variables were included and it increased to 0.364 when the covariates were also included. This justifies the inclusion of covariates such as

woman's age and marital duration as without controlling their effect, the real effect of the predictors (independents) cannot be ascertained. Unadjusted deviation of category mean from the grand mean CEB is shown in table 11. Desired family size of the women just after marriage was found to be the most important predictor of fertility (CEB) as the deviation by category mean was found to be higher. Eta value was also higher for this variable. After adjusting for other independent variables, category means for these variables changed. Beta value also showed substantial difference. When adjusted for other independents as well as covariates, category means and beta value showed drastic change. For women who desired higher family size had higher fertility i.e., category mean increased to 2.95. Thus, the result showed that the real effect of 'desired family size of the women just after marriage' was to raise the fertility. 'Ideal birth interval' perceived by women as 2 to 3 years showed decline in category mean CEB both before and after adjusting for the independents and covariates. Correct knowledge of women about probable conception days in a menstrual cycle showed decline in fertility only after adjusting for independents and covariates.

Result of MCA for behavioural characteristics for ST women are presented in table 12. In case of the ST women the grand mean CEB was observed to be 2.77. The multiple R^2 showed that all the independent predictors together could explain about 9 percent of the variation in the dependent variable CEB, whereas, the independent variables along with the covariates could explain about 39 percent of the variation. This justifies the necessity of including covariates such as woman's age and marital duration to know the real effect of the predictors after controlling the effect of covariates. Desired family size (at the beginning of family building) and ideal family size of the women were found to be the most important predictors of fertility (CEB), since the deviation by category means were higher. Eta values were also higher for these variables. After adjusting for other independent variables, category means for these variables changed a little. Beta value also showed some difference. However, when adjusted for other independents as well as covariates, category means and beta value showed further change. Higher fertility was observed for the women whose reported desired (at the beginning of family building) as well as ideal family size was higher, as category mean for these variables increased to 2.80 and 2.88 respectively. Thus, it shows that the real effect of the variables desired family size and ideal family size of the women were to raise the fertility. Perceived ideal birth interval of 2 to 3 years showed decline in category mean CEB only before adjusting for the independents and covariates.

3.3 Qualitative Information on People's Fertility Behaviour

A qualitative study on fertility preference among sample women and other local people was carried out. Some of the observations from group discussions (GDs) and informal interview with local people of the study area are presented below. The informal interview unlike in depth interviews are not structured. Hence, information are collected from informal interaction with the respondent (s).

- An informal interview was carried out regarding longer interval between marriage and first birth, and subsequent birth-intervals, when there is no substantial use of any spacing method (family planning). The verbatim and responses obtained from these interviews are deciphered from the local language as follows.

1. Situra ST people of Nuamouza village, who are more or less illiterate and with lower socio-economic status reported,

   i. For one or two years the body would not be strong, then how can anything come.

   ii. The fruit can come only when the tree becomes ready to bear.

   iii. How can we know.

   iv. Sir, no more strength we have.

   v. Sir, automatically.

   vi. By own control.

2. Some local educated people, doctors and other medicine men reported,

   i. This is natural.

   ii. There is some problems with nutrition.

   iii. Husband starts sexual intercourse before the wife is sexually stimulated, so the physiology doesn't lead to fertilisation of the egg.

   iv. People don't have knowledge about the most probable days of conception within a menstrual cycle.

From most of the above observations generate an impression that the illiterate person perceive the fertility solely as a function of individual's physiological capacity to bear like any other life-forms, and this is not controlled by human beings. However, only one person reported that it is controlled by them but how exactly was not reported. However, literate people perceived the phenomenon of fertility mainly as behavioural by nature.

- To the question asked to some couples presently in their reproductive span, "after the last child, you don't use contraceptives and both (spouses) stay together; yet, there is no further pregnancy?". The answers were,

  i. Sir, from our side.

  ii. God has given that much, what more is required.

- Even during survey for quantitative data to a question: "whether they need any more children now?", some respondents reported that,

  i. If god gives then can we throw them?

  ii. If we need whether the government will give us?

- Regarding the motivation of female sterilisation, village women and some ANMs, responded as follows,

i. Some women reported that they are angry with the ANM in their village, because she always tells them to go for sterilisation operation and never about any other family planning methods. They reported that the ANMs are not regular and a few reported that they have never seen her.

ii. A few ANMs however reported that, though in pen and paper target free approach (TFA) exist, but in reality, senior medical officers give them (ANMs) some target for female sterilisation and they have to cover them before the next common meeting.

- About the fertility preference and sterilisation regrets, some middle to old aged women told,

i. A family should have 6 children. Even if one or two will be taken away by 'yama' (death god), there are still 4 children and that is OK for a family.

Where as one woman told,

ii. “Due to severe weakness, being frightened, I went for sterilisation operation, though I wanted to have one more daughter”.

4. Conclusion

The bivariate and multivariate analyses of the potential bio-demographic factors of fertility showed that majority of all women reported to have at least heard about any modern family planning method and that too female sterilisation. Less than one fourth were currently using any family planning method mostly female sterilisation. These situations call for an intervention of spacing method of family planning for a regulated fertility.

Analyses of physiological factors showed that fecundity variable like higher ‘average number of years used for child bearing’ emerged as an important predictor of lower fertility (except for SC women). The length of menstrual cycle beyond optimum, ANC not received for last delivery and age at menarche more than 12 years were found to reduce fertility. However, results were not very consistent when adjusted for other confounding factors.

Besides, this paper analysed the effect of women’s behavioural factors on fertility. The behavioural factors of women such as higher desired family size and longer perceived ideal birth interval have been consistently associated with lower fertility. For SC population, the association of woman's correct knowledge about probable days of conception within menstrual cycle with lower fertility implies, this knowledge may provide better chance to the woman or couple to adopt some kind of fertility control mechanism.

The verbatim and incidents presented in the paper give an impression that on one hand the child survival is at demand and on the other, there is a need for access to controlled and intended fertility.

Table 1: Physiological Characteristics of the Sample Women

(in percentage)

Variables	SC (N=300)	ST (N=300)	Total (N=600)
Woman's age (in years)			
13-19	12.7	12.0	12.3
20-34	62.0	58.7	60.3
35+	25.3	29.3	27.4
Open BI (in years)			
<2	54.7	57.3	56.0
2-5	24.0	23.7	23.8
6+	21.3	19.0	20.2
Age at menarche (in years)			
<13	69.7	60.3	65.0
13+	30.3	39.7	35.0
Length of menstrual cycle			
<28	4.3	5.3	4.8
28-31	79.3	85.3	82.4
32 +	16.4	9.4	12.8
Age at last delivery (in years)			
<17	5.0	6.4	5.7
17-19	20.7	11.4	16.1
20-29	55.5	57.8	56.6
30-35	13.4	15.4	14.4
>36	5.4	9.0	7.2
Average number of years used for child bearing (in years)			
< 2	31.8	31.6	31.7
2-3	32.2	31.6	31.8
4+	36.0	36.8	36.5
ANC received for last pregnancy			
No	59.7	68.0	63.8
Self at health care	30.7	20.0	25.4
Health worker at home	9.6	12.0	10.8
Family planning use			
Yes	79.7	82.3	81.0
No	20.3	17.7	19.0
Mental strain			
Rare	49.3	49.3	49.3
Less	32.7	39.4	36.0
More	18.0	11.3	14.7

Table 2: Mean Values of Selected Physiological Variables

Variables	SC	ST	Total
Woman's age at marriage (years)	15.9	15.9	15.9
Husband's age at marriage (years)	21.5	21.4	21.4
Age at last delivery (years)	24.1	25.4	24.7
Reproductive duration (years)	11.2	12.1	11.6
Open birth interval (years)	3.5	3.2	3.3
Marital duration (years)	13.0	13.4	13.2
Woman's current age (years)	29.0	29.0	29.0
Husband's current age (years)	34.5	34.8	34.7

Table 3: Mean CEB by Physiological Characteristics of the Sample Women

Variables	SC	ST	Total
Current age (in years)			
13-19	0.57*	0.66*	0.62
20-34	2.76	2.44	2.61
35+	4.07	4.29	4.19
Open birth interval (in years)			
<2	2.48*	2.29*	2.38*[c]
2-5	3.18	2.39	3.23
6+	3.28	3.59	3.42
Age at menarche (in years)			
<13	2.82	2.87	2.84
13+	2.82	2.67	2.71
Length of menstrual cycle			
<28 days	2.50[a]	1.68[a]	2.06[b]
28-31 days	2.90	2.96	2.93
32+ days	-	-	2.29
Age at last delivery (in years)			
<17	1.13*	0.73*	0.91[ac]
17-19	1.33	1.32	1.33
20-29	3.04	2.60	2.82
30-35	3.90	4.41	4.27
36+	5.12	4.44	4.79
Average number of years used for child bearing (in years)			
< 2	2.22	1.55	1.98
2-3	3.64	4.11	3.88
4+	2.60	2.66	2.65
ANC received for last pregnancy			
No	2.73[b]	2.71	2.72[abc]
Self at health care	2.98	2.78	2.90
Health worker at home	2.86	3.11	3.00
Family planning use			
Yes	2.57*[b]	2.54*	2.54*
No	3.80	3.94	3.86
Mental strain			
Rare	2.73	2.52	2.63
Less	2.90	2.96	2.93
More	2.90	3.20	3.02
Total	**2.82**	**2.77**	**2.80**

Note:

[a] refers to significant F value (at 90 per cent CI) for age group 13-19 Years

[b] refers to significant F value (at 90 per cent CI) for age group 20-34 Years

[c] refers to significant F value (at 90 per cent CI) for age group 35 Years and above.

[*] refers to significant F value (at 90 per cent CI) for age group 13-49 Years

Table 4: Summary Result of Multiple Classification Analysis (MCA) for Physiological Variables for All Women

Variables with Category	N	Unadjusted Dev'n	Eta	Adjusted for Independents Dev'n	Beta	Adjusted for Independents + Covariates Dev'n	Beta
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Open birth interval (in years)							
< 2	336	-0.41		-0.48		-0.11	
2-5	143	0.44		0.22		0.31	
6+	121	0.63	0.22	1.06	0.28	-0.07	0.08
Average no. of years used for child bearing (in years)							
< 2	193	-0.88		-0.45		0.16	
2-3	189	1.08		1.19		0.93	
4+	218	-0.15	0.37	-0.63	0.37	-0.95	0.36
Age at Menarche (in years)							
< 13	390	0.05		0.00		-0.04	
13 +	210	-0.09	0.03	0.00	0.00	0.08	0.03
Length of menstrual cycle (in days)							
< 28	29	-0.73		-0.40		-0.16	
28-31	494	0.14		0.08		0.03	
32 +	77	-0.61	0.14	-0.36	0.08	-0.15	0.03
ANC received for last pregnancy							
No	383	-0.08		-0.06		-0.21	
Self from health centre	152	0.11		0.10		0.35	
From health worker at home	65	0.20	0.05	0.14	0.04	0.43	0.13
Multiple R^2				0.192		0.484	
Multiple R				0.438		0.696	

(Dependant variable = CEB (continuous)
Covariates - Woman's current age and Marital duration.
Grand mean CEB- 2.80, N=600

Table 5: Summary Result of Multiple Classification Analysis (MCA) for Physiological Variables for SC Women

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Variables with Category	N	Unadjusted Dev'n	Eta	Adjusted for Independents Dev'n	Beta	Adjusted for Independents + Covariates Dev'n	Beta
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Open birth interval (in Years)							
< 2	164	-00.34		-0.46		-0.09	
2-5	72	00.36		0.19		0.26	
6+	64	0.46	0.18	0.96	0.27	-0.05	0.07
Average no. of years used for child bearing (in Years)							
< 2	98	-0.56		-0.20		0.51	
2-3	95	0.82		0.93		0.78	
4+	107	-0.22	0.28	-0.65	0.32	1.16	0.42
Age at Menarche (in Years)							
< 13	209	0.00		-0.05		-0.10	
13 +	91	0.00	0.00	0.12	0.04	0.23	0.07
Length of menstrual cycle (in days)							
< 28	13	-0.13		0.05		0.20	
28-31	238	0.08		0.05		0.03	
32 +	49	-0.37	0.08	-0.25	0.05	-0.19	0.04
ANC received for last Pregnancy							
No	179	-0.09		-0.13		-0.29	
Self from health centre	92	0.17		0.20		0.40	
From health worker at home	29	0.04	0.06	0.15	0.07	0.51	0.17
Multiple R^2				0.128		0.506	
Multiple R				0.358		0.711	

(Dependant variable = CEB (continuous),
Covariates - Woman's current age, Marital duration.
Grand mean CEB- 2.82, N=300

Table 6: Summary Result of Multiple Classification Analysis (MCA) for Physiological Variables for ST Women

Variables with Category	**N**	**Unadjusted Dev'n Eta**	**Adjusted for Independents Dev'n Beta**	Adjusted for Independent + Covariates Dev'n Beta
(1)	**(2)**	**(3) (4)**	**(5) (6)**	(7) (8)
Open birth interval (in years)				
< 2	172	-0.49	-0.51	-0.14
2-5	71	0.52	0.24	0.32
6+	57	0.82 0.26	1.22 0.30	0.01 0.08
Average no. of years used for child bearing (in years)				
< 2	95	-1.22	-0.69	-0.19
2-3	94	1.34	1.44	1.12
4+	111	-0.09 0.46	-0.62 0.44	-0.78 0.36
Age at Menarche (in years)				
< 13	181	0.10	0.07	0.02
13 +	119	-0.15 0.05	-0.11 0.04	-0.03 0.01
Length of menstrual cycle (in days)				
< 28	16	1.21	-0.67	-0.40
28-31	256	0.19	0.11	0.04
32 +	28	1.03 0.20	-0.58 0.11	-0.15 0.05
ANC received for last pregnancy				
No	204	-0.06	0.01	-0.13
Self from health centre	60	0.01	-0.09	0.21
From health worker at home	36	0.33 0.06	0.12 0.03	0.37 0.09
Multiple R^2			0.280	0.492
Multiple R			0.529	0.701

(Dependant variable = CEB (continuous),
Covariates - Woman's current age, Marital duration.
Grand mean CEB- 2.77, N=300

Table 7: General Behavioural Characteristics of the Sample Women

(in percentage)

Background Characteristics	SC (N=300)	ST (N=300)	Total (N=600)
Perceived ideal family size			
Don't know	10.7	9.3	10.0
1-3	63.6	63.0	63.3
4+	25.7	27.7	26.7
Perceived ideal birth interval			
Don't know	15.7	14.7	15.2
1 year	2.0	5.0	3.5
2-3 years	56.6	63.3	60.0
4+ years	25.7	17.0	21.3
Perceived ideal interval between marriage and first birth			
Don't know	19.7	18.7	19.3
1 year	15.0	26.3	20.7
2 years	44.0	37.3	40.5
3+ year	21.3	17.7	19.5
Perceived ideal no. of sons			
Don't know	15.0	15.7	15.5
1	40.1	19.7	29.5
2	38.9	48.3	43.8
3+	6.0	17.3	11.2
Desired no. of sons just after marriage			
Don't know	29.3	36.0	32.5
1	33.0	17.3	25.2
2	30.4	35.7	33.0
3+	7.3	11.3	9.3
Woman takes part in fertility decision			
No	25.3	21.3	23.3
Yes	74.7	78.7	76.7
Know about any family planning method			
Yes	83.3	84.3	83.8
No	16.7	15.7	16.2
Knowledge about probable period (days) of conception			
Don't know/wrong	92.3	90.3	91.3
Right	7.7	9.7	8.7

Table 8: Mean Values of Behavioural Variables

Variables	SC	ST	Total
Woman's ideal family size	2.57	3.09	2.83
Woman's ideal interval between marriage and first birth (year)	1.80	1.62	1.71
Woman's ideal BI (years)	2.72	2.47	2.60
Woman's ideal no. of sons	1.43	1.73	1.58
Woman's desired no. of sons	1.26	1.43	1.35
Woman's desired family size	2.08	2.11	2.09
Husband's desired family size	1.87	1.73	1.80
Total conceptions	3.05	2.94	2.99
Total living children	2.33	2.22	2.28
CEB	**2.82**	**2.77**	**2.80**

Table 9: Mean CEB by Behavioural Characteristics of the Sample Women

Variable	SC	ST	Total
Ideal family size			
Don't know	2.56	3.42[b]	2.96
1-3	2.75	2.33	2.56
4+	3.10	3.23	3.17
Ideal birth interval			
Don't know	3.02[c]	3.02	3.02[b]
1 year	3.66	3.13	3.28
2-3 years	2.73	2.72	2.73
4+ years	2.83	2.64	2.75
Ideal interval between marriage and first birth			
Don't know	3.00	3.05	3.02[a]
1 year	2.97	2.45	2.64
2 years	2.54	2.94	2.72
3+ years	3.12	2.61	2.88
Ideal no. of sons			
Don't know	2.60[b]	2.89*[b]	2.75[b]
1	2.55	1.94	2.35
2	3.15	2.80	2.95
3+	3.00	3.52	3.38
Desired no. of sons just after marriage			
Don't know	3.12	3.33*[bc]	3.24[bc]
1	2.31	1.76	2.12
2	2.86	2.50	2.67
3+	3.72	3.41	3.53
Desired family size just after marriage			
Don't know	3.14	3.34*	3.25
1	1.50	2.66	2.20
2	2.35	1.70	2.12
3+	3.00	2.75	2.86
Woman takes part in fertility decision			
No	2.46[b]	2.40	2.43*
Yes	2.94	2.87	2.91
Knowledge on probable period of conception			
Don't know/wrong	2.81[b]	2.79	2.80
Right	2.91	2.62	2.75
Knowledge about any family planning method			
Yes	2.84	2.88	2.86*
No	2.70	2.17	2.44
Total	**2.82**	**2.77**	**2.8**

Note: [a] refers to significant F value (at 90 per cent CI) for age group 13-19 Years
[b] refers to significant F value (at 90 per cent CI) for age group 20-34 Years
[c] refers to significant F value (at 90 per cent CI) for age group 35+ Years
* refers to significant F value (at 90 per cent CI) for age group 13-49 Years

Table 10: Summary Result of Multiple Classification Analysis (MCA) for Behavioural Characteristics for All Women

Variables with Category	**N**	**Unadjusted Dev'n**	**Eta**	**Adjusted for Independents Dev'n**	**Beta**	Adjusted for Independents+ Covariates Dev'n	Beta
(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**	(7)	(8)
Ideal family size							
Don't know	60	0.17		-0.56		0.01	
1-3	350	-0.23		-0.02		-0.02	
4+	190	0.38	0.13	0.22	0.10	0.03	0.01
Ideal birth interval							
Don't know	91	0.22		0.36		0.22	
1 year	21	0.49		0.69		0.25	
2-3 years	360	-0.07		-0.12		-0.10	
4+ years	128	-0.04	0.06	-0.05	0.10	0.07	0.06
Desired family size just after marriage							
Don't know	197	0.45		0.49		0.19	
1-2	158	-0.67		-0.65		-0.35	
3+	245	0.07	0.20	0.03	0.20	0.07	0.10
Woman takes part in fertility decision							
No	140	-0.36		-0.43		-0.18	
Yes	460	0.11	0.09	0.13	0.11	0.06	0.05
Knowledge on probable period of conception							
Don't know/wrong	548	0.00		0.00		0.00	
Right	52	-0.05	0.01	0.01	0.00	0.02	0.00

(Dependant variable = CEB (continuous),
Covariates - Woman's current age, Marital duration.
Grand mean CEB - 2.80, N=600.

Table 11: Summary Result of Multiple Classification Analysis (MCA) for Behavioural Characteristics for SC Women

Variables with Category	**N**	**Unadjusted Dev'n**	**Eta**	**Adjusted for Independents Dev'n**	**Beta**	Adjusted for Independents+ Covariates Dev'n	Beta
(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**	(7)	(8)
Ideal family size							
Don't know	32	-0.26		-1.85		-1.09	
1-3	191	-0.07		0.23		0.18	
4+	77	0.28	0.08	0.19	0.31	-0.01	0.18
Ideal birth interval							
Don't know	47	0.20		1.10		0.64	
1 year	6	0.84		1.12		1.08	
2-3 years	170	-0.09		-0.28		-0.24	
4+ years	77	0.01	0.08	-0.14	0.25	0.05	0.17
Desired family size just after marriage							
Don't know	89	0.32		0.57		0.22	
1-2	101	-0.49		-0.64		-0.34	
3+	110	0.19	0.17	0.13	0.24	0.13	0.12
Woman takes part in fertility decision							
No	76	-0.36		-0.48		-0.35	
Yes	224	0.12	0.10	0.16	0.14	0.12	0.10
Knowledge on probable period of conception							
Don't know/wrong	277	-0.01		-0.01		0.02	
Right	23	0.09	0.01	0.11	0.02	-0.28	0.04

(Dependant variable = CEB (continuous),
Covariates - Woman's current age, Marital duration.
Grand mean CEB- 2.82, N =300.

Table 12: Summary Result of Multiple Classification Analysis (MCA) for Behavioural Characteristics for ST Women

Variables with Category	**N**	**Unadjusted Dev'n**	**Eta**	**Adjusted for Independents Dev'n**	**Beta**	Adjusted for Independent + Covariates Dev'n	Beta
(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**	(7)	(8)
Ideal family size							
Don't know	28	0.65		0.46		0.96	
1-3	159	-0.44		0.28		-0.25	
4+	113	0.45	0.21	0.29	0.14	0.11	0.16
Ideal birth interval							
Don't know	44	0.25		0.14		-0.07	
1 year	15	0.36		0.54		-0.02	
2-3 years	190	-0.05		0.01		0.03	
4+ years	51	-0.13	0.06	0.08	0.06	-0.03	0.02
Desired family size just after marriage							
Don't know	108	0.57		0.49		0.23	
1-2	57	1.02		0.83		-0.52	
3+	135	-0.02	0.25	0.04	0.21	0.03	0.12
Woman takes part in fertility decision							
No	64	-0.37		0.42		-0.01	
Yes	236	0.10	0.09	0.11	0.10	0.00	0.00
Knowledge on probable period of conception							
Don't know/wrong	271	0.02		0.00		-0.04	
Right	29	-0.16	0.02	0.04	0.01	0.37	0.05

(Dependant variable = CEB (continuous),
Covariates - Woman's current age, Marital duration.
Grand mean CEB - 2.77, N =300.

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