©Human Biology Review
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Human Biology Review (ISSN 2277 4424) 3 (1) 2014
Original scientific paper (Haloi pp.1-14)
Revised and Accepted on November 2, 2013

Fertility differentials by incidence of marriage and their reproductive wastage in a Muslim population from rural north-east India

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Haloi A. 2014. Fertility differentials by incidence of marriage and their reproductive wastage in a Muslim population from rural north-east India. Human Biology Review, 3(1), 1-14.

ABSTRACT

The study strives to assess the fertility differentials by women's present age, influence of incidence of marriage (whether once or more than once married /consanguineous or non-consanguineous marriage), their reproductive wastage and the effect of socio-economic factors on reproductive wastage of women in a rural Muslim population of North-East India. Data for the present study were collected on 1034 married women (15-49 years) through structured schedule by cross sectional method and then presented in terms of percentage, mean, and standard error. Student's t-test and ANOVA test were also applied to see the significant difference. The multiple regression analysis was used to predict whether or not reproductive wastage depends on some other independent variables. . The present study reveals that mean live births (fertility) are directly proportional to the advancement of age of women, which is probably due to the fact that higher number of pregnancies in older women results from a lack of education and antenatal care leading to concomitant miscarriages and stillbirths. Marriage among the Assamese Muslims was found to be very 'stable' as only 12 females (1.17%) of all married individuals reportedly changed their mates. There are 23.73% women, whose marriage is consanguineous while 77.27% women have non-consanguineous marriage. In the former group, 38 (3.7%) women have given birth to physically deformed children while not a single case of physically deformed children was reported among the mothers of the latter group. The frequency of reproductive wastage, of all the pregnancies considered in this study, was found to be 14.32%. Further the study shows that women's age, maternal education, type of family, household income and antenatal care are important factors in regulating the fertility and reproductive wastage of a population.

Key Words: *Fertility; Maternal age; Intensity of marriage; Consanguineous marriage; Reproductive wastage.*

INTRODUCTION

The study on fertility is of immense importance as it is one of the major positive forces for the balance of vital processes. Fertility is directly influenced by a set of social and biological factors. Fertility is the reproductive performance of an individual or population, measured as the number of viable offspring produced over a period and it is generally

expressed as the number of live births per year per thousand of the population (Jones *et. al.,* 1995). Aarzoo and Afzal (2006) have reported incidence of marriage, reproductive fitness, reproductive wastage and selection intensity among women of high rank Muslims (Ashraf) and low rank Muslims (Ajlaf) by retrospective method. Current literature clearly demonstrates that various social, economic and demographic factors are correlated with fertility rates. Akmam (2002) has provided a fairly comprehensive list of determinants of fertility in developing countries.

The reproductive behaviour, as many other aspects concerning the human being, can be understood as the result of co-evolution of the cultural, socio-economic and biological systems that each population develops according to the environment it lives in (Bernis 2005). Bhasin and Shampa (2007) stated that the relationship between fertility and independent determinants such as economic and socio-cultural characteristics, physical environment has also been explored, which revealed possible influence. Quite on the contrary, reproductive behavior did not vary noticeably amongst women within 20 to 82 years of age in a rural European population (Javier and Martínez, 2010).

Consanguineous marriages have been practiced since the early existence of modern humans. Until now consanguinity is widely practiced in several global communities with variable rates depending on religion, culture, and geography. Consanguineous marriages can lead to a much higher risk of having an affected child with an inherited disorder or disease. Most consanguineous couples can have normal healthy children. However, couples in a consanguineous marriage are always in risk to have physically deformed children by birth. At present, about 20% of world populations live in communities with a preference for consanguineous marriage (Modell and Darr, 2002). Khlat (1988) and Vardi-Saliternik et al. (2002), conducted a study on consanguinity and found that consanguinity in the Arab World is not only confined to Muslim communities. Several other communities, including the Lebanese, Jordanian, and Palestinian Christian populations, have also practiced consanguinity, but to a lesser extent than Muslims. Empirical evidence from South Asia, where inbreeding levels appear to have been historically preferential, generally shows a positive association between consanguinity and fertility (Bittles, 1995). For example, a study of Muslim communities in North India reported higher fertility among women in consanguineous unions after controlling for number of live births, child deaths and socioeconomic status; however, no allowance was made for variation in exposure time, i.e. duration of marriage (Basu, 1975). A South Indian study that did employ control for marriage

duration found a higher mean number of pregnancies and live births in consanguineous unions but no difference in the mean number of living children, implying higher child mortality in consanguineous marriages (Asha Bai et al., 1981). In Pakistan, a multi-centre urban study reported a positive association between consanguinity, time to first delivery and mean number of pregnancies (Shami, Schmitt & Bittles, 1990). This association persisted for live births, although the differential was reduced due to greater neonatal, infant and childhood deaths in the offspring of consanguineous marriages (Shami, Schmitt & Bittles, 1989; Bittles, Grant & Shami, 1993).

Barbhuya and Das (2013) tried to trace the reproductive performance and socioeconomic correlates among the Bengali Muslim women of Cachar district of Assam, India and their study reveals that live birth and pregnancy wastage of the Bengali Muslim women are 4.19 and 0.22 respectively and the mean pregnancy is high in those women who got married before 18 years (4.86). Average conception is found to be high (4.85) in consanguineous marriages whereas annual family income shows a low positive correlation with pregnancy and fertility rate is low among the women who live in joint families (3.61).

Socio-economic and cultural factors play an important role in influencing the fertility of a population. Various socio-economic and cultural factors that affect fertility are marriage system, age at marriage, remarriage, education, occupation, income, family structure, value of children, rural–urban difference, religion etc. That is why there is a strong need for research into the influence of the socio-cultural environment and it's specific characteristics, and not only because of the mid and long-term socio-economic implications, but the immediate ones the reproductive patterns have on the biology and health of both women and their children (Sarasqueta 2001; Kirchengast and Hartman 2003 a, b; Alonso *et al*., 2005).

Fertility among the Muslim women is fairly high in India, especially in rural areas where the women are expected to be home-makers and caregivers to their children, and motherhood is considered as one of the most important professions. It has been reported (Rajan, 2005) that a significantly higher rate of Muslim fertility is observed in eastern and north-eastern parts of India in states like West Bengal and in Assam (where the present study was conducted). It is of great concern to know the reasons why and what factors are influencing high fertility and how is it affecting the fertility and reproductive wastage of women in these populations. The present study considers a few important parameters which are expected to influence the high fertility and the reproductive wastage of women of this population which are discussed elaborately in methods.

The study area included two villages viz., Agyathuri and Dadara, situated in Kamrup district of Assam, a north-eastern state of India. The village of Agyathuri has a purely indigenous Muslim population while in case of Dadara, the whole stretch is inhabited by 75% of indigenous Assamese Muslim people and rest is inhabited by the Assamese Hindus. The Hindu settlement starts where the Muslim ends. For the present purpose, these Hindu inhabitants have been excluded.

The practice of women's health issues like fertility has become increasingly international in focus of safety motherhood with sustained and effective collaboration across the world. The goals of these types of studies and their methods vary with the circumstances of the women involved. Keeping this in mind the present study was undertaken by using few parameters of fertility with the aim to assess the relationship between 1. Age of women and their fertility (live births), 2. Influence of incidence of marriage (intensity of marriage, i.e. number of marriage(s) of a particular women upto the period of data collection, and consanguineous marriage) on their fertility, 3. Reproductive wastage by the age of women and 4. Effect of some important socio-economic factors on reproductive wastage.

MATERIALS AND METHODS

Sample

A review committee of the department of Anthropology, NEHU was apprised of the study and due approval was obtained. The fieldwork was conducted from March 2007 to December 2008. According to the willingness of the study population a cross sectional study has been undertaken among 1034 married women (aged 15-49 years) with informed consent.

1. Fertility records: The fertility schedule was completed by filling in the information on pregnancy history of each women like present age of the women, age at marriage, intensity of marriage, consanguineous marriage, age at each conception, number of live births, number of reproductive wastage (abortion, miscarriage and still births), any physically deformed children was born or not, sex of children, etc. from all the ever married women. Information's given by the women were cross checked from their respective husbands at random. The structured schedule was used here is similar to those for the National Family Health Survey-2 (NFHS-2) from15-45 years of women.
2. Antenatal care (ANC): These included questions on the number of ANC visits during their pregnancy.

3. Socio-economic variables taken into consideration were - monthly income of the households and educational level of the parents (both husband and wife), family type, etc. These variables were classified arbitrarily into different groups and/or categories with a view to understanding their influence on fertility, reproductive wastage and women's health status of the study population as suggested by Mahadevan (1986).

The classifications may be briefly described as follows:

Income groups: Data on household income were collected directly from the head of the house. The monthly income of the households (from all sources as reported in the interview) was classified as follows:

Below50^{th} percentile (≤Rs.7500) = Low Income Group

50^{th} to 75^{th} percentile (Rs.7501-9000) = Middle Income Group

Above 75^{th} percentile (≥ Rs. 9000) = High Income Group

Educational Level: Data on educational attainment of individuals in the present study were arbitrarily classified as follows: The categories of illiterates include those individuals who were unable to read and write and those who had no education. The individuals who attended school up to V were grouped into Primary level of education. The individuals with educational level from VI-X are secondary and XI-XII was grouped into higher secondary level of education. Graduates were grouped into another category.

Family Type: The families were classified into two types viz. nuclear and joint families.

Data Analysis

All data were managed and analysed using SPSS (PC Software), version 11.5. The data were presented in terms of percentage, mean and standard error. The differences between the two means were tested, using student's t-test, while the differences in more than two means were determined, using one-way analysis of variance (ANOVA). The multiple regression analysis was used to predict whether or not age at marriage and reproductive wastage depends on some other independent variables.

RESULTS

Table 1. Fertility by age of women

Age groups (in years)	No. of women	Fertility (Live births)	Mean ± SE
≤ 23	270	387 (9.06%)	1.43 ± 0.06
24-33	392	1228 (28.75%)	3.13 ± 0.05
34-43	176	1101 (25.78%)	6.26 ± 0.06
≥44	196	1555 (36.41%)	7.93 ± 0.04
Total	1034	4271 (100.00%)	4.13 ± 0.08

ANOVA of age of mothers by their fertility

Source of Variation	SS	df	MS	F	P-value
Between women's age Groups	214.2443	3	71.41476	86.88157	Significant at 1%

The Table 1 shows the fertility by age of women. Altogether there are 4271 live births out of 1034 women. The percentage frequency of the live births varies from 9.06% in the age group of ≤ 23 years to 36.41% in the age group ≥44 years. The mean live birth in the study population varies from 1.43 ± 0.06 in the age group up to ≤ 23 years to 7.93 ± 0.04 in the age group ≥44 years. It may further be noted that the mean live births are directly proportional to the advancement of age. In the ANOVA test, a significant difference is observed between women's age groups and their live births (F= 86.88157, significant at 1% of probability).

Table 2 shows the fertility performances by intensity of their marriages. Majority of the village women i.e., 1022 (98.83%) have married once and only few i.e., 12 (1.17%) have married more than once and accordingly, the total number of pregnancies are 4571 and 54 and the total number of live births are 3783 and 47 respectively.

Table 2. Fertility by intensity of marriage

Intensity of marriage	No. of married women	Total pregnancies	Total live births
Once married	1022 (98.83%)	4571	3783
More than once married	12 (1.17%)	54	47
Total	1034	4625	3830

Table 3. Test of significance between (i) total live births and intensity of marriage (ii) total pregnancies and intensity of marriage

(i) total live births and intensity of marriage				
Intensity of marriage	Number of mothers	Mean no. of live births per mother Mean ± SE	t-value	Remarks
Once married vs more than once married	1022 12	3.70 ± 0.07 3.92 ± 0.80	-0.27	Insignificant
(ii) total pregnancies and intensity of marriage				
Intensity of marriage	Number of mothers	Mean no. of pregnancies per mother Mean ± SE	t-value	Remarks
Once married vs More than once married	1022 12	4.66 ± 0.09 4.50 ± 0.90	0.18	Insignificant

Test of significance between (i) total live births and intensity of marriage (ii) total pregnancies and intensity of marriage is shown in Table 3, which reveals that the mean number of live births per mother for once married is 3.70 ± 0.07 and more than once married is 3.92 ± 0.80. The table further shows that the mean number of live births among the once married mothers do not differ significantly to more than once married mothers, and the t-value is -0.27. The table reveals that the mean number of pregnancies among the women who married once is 4.66 ± 0.09 and in the women who married more than once is 4.5 ± 0.90. The difference between these two groups of women, in respect of their total number of pregnancies, is not significant (t = 0.18).

Fertility and child mortality by consanguineous marriages among the women of study population is shown in Table 4. There are 235 (23.73%) women who have consanguineous marriages and 799 (77.27%) have non-consanguineous marriages. The percentage frequencies of child death are found to be higher among the mothers who had consanguineous marriages i.e., 151 (15.79%) compared to the non consanguineous marriages being 417 (14.51%). The average number of live births is recorded more among the consanguineous marriages (4.07) then to the non-consanguineous marriages (3.60). Table 4 also shows the ANOVA analysis between consanguineous marriages for live births. It was found that Consanguineous and Non-consanguineous marriages differ significantly ($p < 0.01$) with respect to live births.

Table 4. Fertility by consanguineous marriages

Marriages	No. of Mothers	Live births	Mean ± SE
Consanguineous	235 (22.73)	1608 (37.65)	6.84 ± 0.13
Non-consanguineous	799 (77.27)	2663 (62.35)	3.33 ± 0.08
Total	1034	4271 (100.00)	4.13 ± 0.08

ANOVA between consanguineous/non-consanguineous marriages with respect to live births					
Source of Variation	SS	df	MS	F	p-value
Between Consanguineous and Non- consanguineous marriages	2236.756	1	2236.756	484.4735	Significant at 1%

Figures in parentheses indicate the percentages

Table 5 shows the cross tabulation of consanguineous marriages and physical deformity among the Muslim children of Dadara and Agyathuri villages. There are 38 (3.7%) mothers who have given birth to physically deformed children out of a total of 1034 mothers considered for the present study. However, not a single case of physically deformed children was observed among the mothers who had non-consanguineous marriages. The chi square value is found to be 134.129 which is significant at 1%.

Table 5. Physical deformity in children with respect to type of marriage

Marriages	Physically deformed children	Normal	Total
Consanguineous	38 (3.7%)	197 (19.1%)	235 (22.7%)
Non-consanguineous	0(0.00%)	799 (77.3%)	799 (77.3%)
Total	38 (3.7%)	996 (96.3%)	1034 (100.00%)
$\chi^2 = 134.129$, df = 1, $p < 0.01$			

Reproductive wastage by age of women is shown in Table 6. From the above table it is observed that the percentage of pregnancies, reproductive wastage like miscarriages and still births increase as the age groups of the women increases. Not a single case of abortion was recorded in the age group ≤23 years and 44+ years. However, the highest percentage (68.94%) of abortion was recorded among the women whose age group falls between 24 and 33 years.

Highest percentages (44.16%) of miscarriages were observed among the women of the age group 44+ years, followed by 34-43 years and least is recorded in the ≤23 years. Eleven cases (3.11%) of still births were recorded in the lowest age group of women i.e., ≤ 23 years and highest recorded (43.50%) in the age group of 44+ years. The percentage frequency of still births increases with the increase in age group of the women. Minimum percentage of total reproductive wastage was recorded in ≤23 year's age group with 2.57% and highest being i.e., 43.81% in the age group 44+ years.

Table 6. Reproductive wastage by age of women

Age (in years)	No. of mothers	Total no. of pregnancies	Reproductive wastage			Total
			Abortion*	Miscarriages	Still births	
≤23	270	398	0	6	11	17
(%)	(26.11)	(8.61)	(0.00)	(1.95)	(3.11)	(2.57)
24-33	392	1311	91	56	84	140
(%)	(37.91)	(28.35)	(68.94)	(18.18)	(23.73)	(21.15)
34-43	176	1205	41	110	105	215
(%)	(17.02)	(26.06)	(31.06)	(35.71)	(29.66)	(32.48)
44+	196	1710	0	136	154	290
(%)	(18.96)	(36.98)	(0.00)	(44.16)	(43.50)	(43.81)
Total	1034	4624	132	308	354	662
			(2.85)	(6.66)	(7.66)	(14.32)

**Induced abortion. Figures in parentheses indicate the percentages*

The summary of multiple regression analysis of socio-economic factors on reproductive wastage is given in Table 7, considering that reproductive wastage is one of the indicators of women's fertility status in the study population by assuming that unhealthy women experience more reproductive wastage. The prevalence of reproductive wastage is significantly associated with the maternal education (t = -4.3148), type of family (t = -2.8845), household income (t = 3.0765) and antenatal care (t = 6.9333). However, the present analysis shows no relation between reproductive wastage and factors like age at marriage (t = -4.3148) and paternal education (t = -1.9057). Thus, it seems that maternal education, type of family, household income and antenatal care are important factors in regulating the reproductive wastage of the present population.

Table 7. Coefficient of the multiple regression of reproductive wastage on independent factor

Parameters	Coefficient of regression(B) And its Standard Error(SE)	t-value	p-level
	B ± SE		
Reproductive wastage			
Age at marriage	-0.0033 ± 0.03	-0.1104	Insignificant
Maternal education	-0.4538 ± 0.11	-4.3148	Significant at 5%
Paternal education	-0.1781 ± 0.09	-1.9057	Insignificant
Type of family	-0.2069 ± 0.07	-2.8845	Significant at 5%
Household income	0.0001 ± 0.00	3.0765	Significant at 5%
Antenatal care	0.7703 ± 0.11	6.9333	Significant at 5%
Constant	1.2168 ± 0.54	2.2638	**Significant at 5%**

DISCUSSION

Our findings indicate that older women have higher fertility then the middle aged women. This is probably due to the fact that higher number of pregnancies in older women results from a lack of education and antenatal care which again leads to concomitant miscarriages and stillbirths. Marriage among the Assamese Muslims is found to be very stable by and large. It is seen that only 12 females (1.17%) of all married individuals have changed their spouses. The author here would like to discuss about the consanguinity because of it's prolong practice in Muslim population and which has now been recognised for its bad genetic effect on their offspring. In the present study population, there are 23.73% women who have consanguineous marriage and 77.27% women have non-consanguineous marriages and there are 38 (3.7%) mothers who have given birth to physically deformed children out of a total of 1034 mothers considered for the present study. However, not a single case of physically deformed children was observed among the mothers who had non-consanguineous marriages. Similar results have been reported by Aarzoo and Afzal (2006). They reported that the consanguineous marriage of the Muslim women of North India comprises 26% where as non consanguineous women are 74%. Muslims in India belong to two major sects: Sunniis and Shias, while each sect has different biradaris, grouped under Ashraf and Ajlaf (Ansari, 1959). The Ashrafs are found to

have low fertility among non consanguineous category than the consanguineous ones (Hussain and Bittles, 2004).

In the frequency of reproductive wastage (still birth, miscarriages and abortion), based on total number of pregnancies is found to be 14.32%. Among the Semsa of North Kachar Hills (Limbu, 1996), has reported that the frequency of reproductive wastage is 5.90%, which is certainly lower in comparison with the present population. Ghosh (1976) has reported that the frequency of reproductive wastage among the Kota of Nilgiri Hills is 8.34%, which is again lower than presently studied population. Das and Das (1982) have found that the frequency of reproductive wastage is 2.87% among the Assamese Hindu castes, where as it is 2.55% among the Mongoloid populations and 1.64% among the Muslims of Assam. So, it shows that among the various population groups of Assam the frequency of reproductive wastage is comparatively very high in the present population. The study also reveals that maternal education, type of family, household income and antenatal care are important factors in regulating the reproductive wastage of the present population. In studies on fertility differentials there is an ever present threat of bias based on religion and ethnicity and one has to be vigilante to exclude unwarranted conclusions on the final analysis. Nevertheless, the observations of Rajan (2005) that the difference in fertility rates between Muslims and Hindus in Assam is +2.3 while the difference between Muslim female literacy rate and Hindu female literacy rate is -20.9 indicates the importance of mother's education. It is of some concern to note that such low levels of socio-economic development are persistent in an area which is close to the state capital. Thus, social development initiatives, particularly female education, could be an important measure in reduction of both fertility rates as well as reproductive wastage in similar rural populations.

CONCLUSION

The study shows that the mean live births are directly proportional to the advancement of age of women and the frequency of reproductive wastage is comparatively high in the study population. Further, the intensity of more than once marriages is found to be less in the present study whereas, presence of consanguineous marriages and its effect on children are noticeable as was theoretically expected. The coefficient of the multiple regression analysis of the reproductive wastage on independent factor also reveals that maternal education, type of family, household income and antenatal care are important

factors in regulating the reproductive wastage of the present population. Association between the reproductive wastage and age at marriage, maternal and paternal education, type of family, household income and antenatal care needs to be taken into account in inbreeding studies in human populations. This finding reveals that, women's age at marriage and the maternal education has a negative influence on reproductive wastage. The effect of female education on fertility is found to be negative. Women's education may provide better employment opportunities outside the home which leads to better socio-economic status and, most importantly, the knowledge about safe pregnancy, so to increase the awareness about antenatal care during their pregnancy and to have a save motherhood and protect them from reproductive wastage. Another thing is, age at marriage can be raised by providing education to females which is seen very early in this population.

Based on the findings of this study, it may be suggested that attention should be focused on the need for providing educational facilities, particularly for women in rural areas in order to have safe pregnancy and good health of women in particular and the population as a whole. However the present study agrees with the suggestion of some other previous studies conducted on women's health issues, for example, according to Ehlayel et al., (2013), when suspecting primary immunodeficiency diseases (PID) in children. Primary prevention of PID in Middle East communities should consider consanguinity reduction through public awareness and education and premarital counseling programs. Nevertheless the WHO-recommended approach to minimizing the negative effects of consanguinity on child health should be followed, i.e. the identification of families with a high risk of a genetic disease and the provision of prospective genetic counselling. World Health Organization (WHO), 1991 reveals that the male-dominated medical establishment continues to make health promotion policies for women. Women must have access to a more accurate information base about women's health and the link between their health and socioeconomic roles. They must be full partners in formulating and implementing health promotion strategies. Yet, such a database does not exist due to systemic bias in research.

ACKNOWLEDGEMENTS: The author acknowledges the cooperation of the people of Dadara and Agyathuri villages where this study was conducted.

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