



**REPRODUCTIVE FITNESS: A CASE STUDY OF REPRODUCTIVE STATUS OF  
FOUR ENDOGAMOUS INDIAN POPULATION OF SAUNDIK VAISHYA  
COMMUNITY IN DISTRICT MUNGER (BIHAR), INDIA**

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**ABSTRACT**

A case study of reproductive status of four predominant Saundik Vaishya populations namely Dhaneshwar, Kalal, Jaiswal and Biahut Kalwar of Munger district (Bihar), India has been studied. Saundik Vaishya population has grown and developed remarkably as a result of the increased number of people choosing for higher education and better future life. This population is an interesting and challenging subject for demographic research as these groups are business oriented and have played important role in the social uplift of the district. The population has been preferred owing to the existence of endogamous groups within it. Reproductive fitness has been studied on the basis of the parameters such as age at menarche, age at menopause, sterility, fertility, mortality and twinning on a comparative basis. Early menarche is responsible for early menopause and late menarche is responsible for late menopause. Decrease in mortality rate might be due to proper medical facility, advancement in medical sciences, education of mother, age of mother at the time of marriage, hygiene, etc. During our survey we found that education of mother and family economic status play a significant role in determining fertility & mortality rate among the population and hence the reproductive fitness. The findings suggest that these data would be useful in medical diagnosis and genetic counselling.

**Keywords:** *Reproductive fitness, Saundik Vaishya, Fertility, Mortality, Menarche, Menopause, Endogamy*

## INTRODUCTION

A very unique caste system is prevalent in India. This system may be defined as one whereby a society is divided into a number of self contained and completely segregated units (groups), the mutual relations between which are ritually determined in a graded scale (*Hutton, 1963*). According to an estimate, there are at present, approximately more than 3000 castes in India which vary in their size: some have only a few score men, while others claim millions of members. Each one is distinct from one another by origin, endogamy and traditional job. Endogamy is decidedly the most distinctive basis of a caste.

Caste is the most general form of social organisation in India. The term 'caste' is hardly older than 200 years in English language. It appears to be derived from a Portuguese word 'casta' meaning 'breed' or 'clan', and used in the sense of tribe or even race. It often applied to the lowest Indian classes in contradistinction to their overlords. The word is probably derived ultimately from the Latin 'castus' which means pure (*The Encyclopaedia Britannica, 1932*).

Due to endogamy, the circulation and interaction of genes of a particular group takes place in a limited circle resulting into a separate gene pool for each group or caste. Such gene pools usually differ with each other on account of their genetic variability, which are of course, greatly proportional to the period of separation or since they have started this practice.

The people of India exhibit a unique caste system range of socio-cultural, linguistic, religious, ethnic and biological diversity. Several waves of people of different stocks, cultures and languages either invaded India or migrated to India from different directions and contributed significantly to the present day gene pool of the sub continent. These people not only settled in India but also gradually merged and mingled with the local population (*Raj et al., 2015*).

Natural selection operates through differential mortality and fertility among human population. According to Darwin, natural selection for the descent of the organisms, which refers to the evolution, operates through "survival of the fittest" referring differential mortality (prenatal and postnatal) of individuals within a species and the selection agent of differential fertility. Fertility is the most important factor among the two factors to affect population growth, and the other one is mortality. Over the last four decades, both fertility and mortality rates fell, but the decline of mortality was strong enough to offset the fertility (*Birla et al., 2018*).

Changing fertility and mortality patterns due to modernising forces leading to socioeconomic and demographic changes have a profound effect on the opportunity for natural selection in human population. The people of India are socially organised into a number of distinct groups that are largely more or less endogamous and reproductively isolated. This nature provides a good opportunity to understand the dynamics of evolution (*Dharani et al., 2003*).

It is probable the natural selection operating through differential mortality, is less important, among modern human population where differential fertility appears to be more effective (*Prakash et al., 2010*). Fertility measures the rate at which population adds to itself by births.

Human fertility is responsible for biological replacement and maintenance of human society (*Bhende et al., 1992*).

The interval between menarche and menopause defines a woman's natural reproductive span. This important milestone in female has been found to vary greatly across countries (*Thomas et al., 2001*). There are several milestones in the life of female as she has to reproduce. The last major event of this sexual development is the first episode of menstruation referred to as menarche (*Ersoy et al., 2005*).

Menarche and menopause are the two landmarks that signal the beginning and the end of normal reproductive life span of women respectively. Menarche is defined as age at the first menstrual period and menopause is defined as age at the last menstruation (*Birla et al., 2018*).

## **SUBJECTS and METHODS**

Among the various communities of Munger district in particular the 'Saundik' Vaishya community claim our attention. These groups are basically business oriented and have played important role in the social uplift of the district. Saundik Vaishya comprises many endogamous populations of which the four - Dhaneshwar, Kalal, Jaiswal and Biahut Kalwar are considered here relevant for our studies.

All participants were required to complete a standard self-reported questionnaire with 19 questions addressing age, sex, personal and family medical history, age at menarche, age at menopause, parity, total number of live births, number of male and female baby, number of stillbirths, order of children, smoking - drinking habits, etc. Data on various ingredients of reproductive fitness was collected randomly among Saundik Vaishyas community from villages/towns/cities of Munger district in Bihar and was recorded on questionnaire sheet. The subjects surveyed were mostly from elderly men and women who had completed their reproductive lifespan. Major physical (floods, earthquakes, draught, forest fire), social (certain festival) and political (independence of India, visit of VIP) events were used to determine the age of the subjects. Cross-checking of the data with elder persons of the family was done to correct figures in some confusing cases.

The Saundik Vaishya population of Munger district has been picked up as a case study. The population has been preferred owing to the existence of endogamous groups within it. At the same time the author of this manuscript also belongs to this very population. Thus, it was easier to find the location of the families belonging to this population.

We did a survey of Saundik Vaishya population of Munger district (Bihar) from different locations. The locations that were visited for raw data collection were Munger, Jamalpur, Ratanpur, Bariarpur, Kharagpur, Kalyanpur, Lakshmanpur, Dasrathpur, Asarganj, Tarapur, Sangrampur and Sultanganj. At least 10 families and at most 50 families of each (Dhaneshwar, Kalal, Jaiswal & Biahut Kalwar) population were consulted from each location.

## RESULTS and DISCUSSION

The reproductive fitness of the population has been studied in terms of reproductive potentiality, fertility, and mortality. Reproductive potentiality, in turn, has been studied in terms of age at menarche; age at menopause; frequency of never-pregnant women and birth of twins etc. Fertility has been recorded in terms of a number of live births per mother and the age span of maximum live births. Mortality records have been presented in respect of pre-adolescence. The strength of present study include: the prospective subject design, the large population based sample size and the response rate. In addition to this, the current study was restricted to women who had natural menopause only. The main limitation of this study was that, the age at menarche and menopause were self reported and may, therefore, be subject to recall bias.

**a) Age at menarche:** The age at which a girl menstruates for the first time has a marked bearing on her reproductive potentiality. It has been a common observation that girls undergoing menarche at an early age have a better reproductive capacity than those menstruating at a higher age. The age at menarche is itself determined by several factors, the most important being food and atmospheric temperature. Higher temperature range and rich food are said to be favouring early menarche (*Raj et al; 2015*). The data also includes a few other women who could recall the month and year of their first menstruation. A large number of investigators (*Rakshit, 1962; Pattnaik, 1971; Deka, 1976; Valvi et al., 1981*) have reported about this age among different Indian population. The present data on age at menarche when compared with the upper castes, it reveals that the girls of higher castes menstruate earlier (*Sinha et al., 1980*). This difference may be due to better living standard among the higher castes. The results are in close proximity with those of other workers (*Sinha et al., 1980; Birla et al., 2018*). The age at menarche in all the four population studied ranges (Table-1) from 12-16 years. The mean age in all the population is approximately 14 years (ranging from 13.48 years among Biahut Kalwar and 13.55 years among Kalal).

**Table – 1:** Frequency Distribution of girl’s and women’s for their age at menarche.

Age in completed years	POPULATIONS			
	Dhaneshwar	Kalal	Jaiswal	Biahut Kalwar
12	40	53	42	47
13	69	79	71	73
14	59	70	56	61
15	28	35	30	29
16	09	18	11	12
<b>Total</b>	<b>205</b>	<b>255</b>	<b>210</b>	<b>222</b>
Mean	13.49756	13.55294	13.50952	13.48648
Standard deviation	1.08747	1.16888	1.12066	1.12451
Standard error	0.0759	0.0733	0.0775	0.0756

**b) Age at menopause:** The period in a woman's life (typically between the ages of 45 and 55) when menstruation ceases. Menopause marks the end of the reproductive phase of a woman’s life and usually occurs between the ages of 40 and 60 years (*Bromberger et al;*

1997), and in Western industrialized countries is between 48 and 52 years (*Hardy et al; 2000*). Menopause, also known as the climacteric, is the time in most women's lives when menstrual periods stop permanently, and they are no longer able to bear children. Menopause is the permanent cessation of ovulation and menses – that is, the final menstrual period confirmed by the subsequent 12 consecutive months without a menstrual period (World Health Organisation report, 1990 & 1996). Age of menopause was defined as the age at last menstruation. It is the end of fertility. The age at menopause ranges (Table-2) between the age of 46 and 53 years. It is about 49-50 years. It is 49.39 years among Biahut Kalwar and 49.51 among Dhaneshwar.

Table – 2: Frequency distribution of women for their age at menopause.

Age in completed years	POPULATIONS			
	Dhaneshwar	Kalal	Jaiswal	Biahut Kalwar
46	12	17	13	13
47	10	19	09	19
48	29	37	31	33
49	47	54	49	50
50	56	61	57	52
51	27	33	29	29
52	16	21	18	17
53	08	13	04	09
<b>Total</b>	<b>205</b>	<b>255</b>	<b>210</b>	<b>222</b>
Mean	49.5122	49.4549	49.4619	49.3918
Standard deviation	1.65568	1.77829	1.60471	1.72407
Standard error	0.1156	0.1115	0.1110	0.1159

**c) Sterility:** It can be measured by knowing the frequency of never-pregnant women (of age more than 45 years) in a population. The frequency of sterile or infertile women, i.e., married women of the age 45 and above without any pregnancy, it is quite low in all the four population studied. Sterility rate among all the four population studied is more or less same; it is about 1.50% approx. It ranges (Table-3) between 1.35 among Biahut Kalwar to 1.57 among Kalal. Among Sao-Telies of Nagpur it was reported 4.3% (*Basu et al., 1973*).

Table – 3: Ever and never pregnant married women (at menopause) in different populations.

POPULATIONS	Total number of women surveyed	Number of ever pregnant women	Never pregnant women	
			Number	Percentage
Dhaneshwar	205	202	03	1.46
Kalal	255	251	04	1.57
Jaiswal	210	208	02	1.56
Biahut Kalwar	222	219	03	1.35

**d) Fertility:** Study of human fertility has remained an essential aspect of modern sociology and demography for obvious reasons (*Bhende et al., 1978*). It is a positive force responsible for the growth of a population. For the calculation of fertility, the mean number of full-term live births per mother has been calculated. Net reproductive index (NRI), a measure of fertility, is also helpful in calculating fertility. The fertility rate among Saundik Vaishya community of Munger district shows declining trends. 40 years ago, mean number of children per mother was recorded 6-7 and NRI ranges from 2-3 (Sinha, 1982). But in our investigation we found that (Table-4) mean number of children per mother is only 3-4 and NRI value is approximately 2 (1.89 among Dhaneshwar, 1.69 among Kalal, 1.68 among Jaiswal and 1.93 among Biahut Kalwar).

Table – 4: Mean number of children born per mother and net reproductive index (NRI).

Populations	Mother surveyed	Male live births	Female live births	Total no. of live births	Children per mother	NRI
Dhaneshwar	205	422	388	810	3.95	<b>1.89</b>
Kalal	255	555	432	987	3.87	<b>1.69</b>
Jaiswal	210	432	354	786	3.74	<b>1.68</b>
Biahut Kalwar	222	431	430	861	3.87	<b>1.93</b>

**e) Mortality:** Unlike fertility, mortality is a negative force responsible for determining the growth of a population. It deals with the effects of the death of individuals prior to their reproductive age. It is a major component of a population change and is considered as a regulative force in the growth of a population. The gross mortality rate in all the population is more or less of same magnitude. It ranges from 4.83% among Jaiswal and 5.47% among Kalal. Mortality rate (Table-5) also decreased. It was 17.78% among Kalal (Sinha, 1982), and now it is only 5.47%.

Table – 5: Frequency distribution of infant mortality, adolescent mortality and gross mortality rate among the offspring of the different populations.

Populations	Total live births	Infant mortality		Adolescent mortality		Gross Mortality	
		number	%	number	%	number	%
Dhaneshwar	810	26	3.20	17	2.09	43	5.30
Kalal	987	32	3.24	22	2.22	54	5.47
Jaiswal	786	23	2.92	15	1.90	38	4.83
Biahut Kalwar	861	25	2.90	17	1.97	42	4.87

**f) Twinning:** Twins are two offspring produced by the same pregnancy. Twins can be either monozygotic, that develops from one zygote or dizygotic, that develops from two zygotes. In dizygotic, each twin develops from a separate egg and each egg is fertilized by its own sperm cell. Dizygotic twinning occurs at low rates in all human population worldwide. Historically, about 1 in 80 human births (1.2%) has been the result of a twin pregnancy (*Wikipedia, 2018*). The cause of dizygotic (DZ) twinning lies in the cause of hyper ovulation. The reason for the

relatively high incidence of monozygotic (MZ) twinning in humans remains unclear. The frequency of twin births is lowest (0.76%) among Jaiswal and highest (1.21%) among Kalal (Table-6). The twinning rates reported for general population of Ranchi (0.26%), Patna (1.43%) and of Santhal Pargana (1%) are thus not much different from our data (*Barua, 1977; Ansari, 1980*).

Table – 6: The incidence of twinning in different populations.

Populations	Number of live births			% of twin births
	Total	Single	Twin	
Dhaneshwar	810	792	09	<b>1.11</b>
Kalal	987	963	12	<b>1.21</b>
Jaiswal	786	774	06	<b>0.76</b>
Biahut Kalwar	861	843	09	<b>1.04</b>

Table – 7: Comparative study of reproductive fitness in terms of fertility, mortality and sterility among Saundik Vaishya community of Munger district (Bihar) over last four decades.

Fields	Sinha, K.K. (1982)	Present data (2019)
Mean no. of children per mother	6 – 7	3 – 4
Net Reproductive Index (NRI)	2 – 3	Approx. 2
Gross Mortality Rate	Approx. 15%	Approx. 5%
Sterility Rate	Less than 1% (approx.1%)	More than 1% (approx.2%)

## CONCLUSION

The Saundik Vaishya population of Munger (Bihar) have been studied regarding their reproductive status. It has been concluded that all the four population, considered here, Dhaneshwar, Kalal, Jaiswal and Biahut Kalwar do not differ with each other in their various parameters of reproductive fitness. This is due to the reason that they are practicing endogamy since long run. These parameters are well known to be easily influenced by the environment. As the present population live in the same localities, hence such similarities among them are but natural. It may also be concluded that they may have same origin and have evolved from common ancestors.

We observed that Biahut Kalwar under goes early menarche and early menopause. Same is the case with Jaiswal (Table-1 & 2). So it may be concluded that early menarche is responsible for early menopause and late menarche is responsible for late menopause. When compared with 40 years back data, we found that sterility rate increased over 40 years. It may be due to industrialization, Urbanisation, implementation of western culture and use of drugs. Over the last four decades, both fertility and mortality rates fell, but the decline of mortality was strong enough to offset the fertility. Decrease in mortality rate might be due to proper medical facility, advancement in medical sciences, education of mother, age of mother at the

time of marriage, hygiene, etc. Our findings suggest that these data would be useful in medical diagnosis and genetic counselling.

During our survey we found that education of mother and family economic status play a significant role in determining fertility & mortality rate among the population and hence the reproductive fitness.

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**Ethical approval:** All procedure performed in this study on human participants were in accordance with the ethical standards of the institutional research committee and with the 1964 Helsinki declaration and its later ethical approval.

**Informed consent:** Informed consent was obtained from all individual participants included in the study.



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