Fertility and mortality among the scheduled caste Madigas of Andhra Pradesh, India

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About 1284 selected married women of both MDCDP (Madigas of Cuddapah district) and MDCTR (Madigas of Chittoor district) groups of Andhra Pradesh were studied for fertility and mortality demographic variables. Over 90% of the total conceptions in the pooled Madigas results in live births. A small proportion of prenatal deaths and high proportion of post-natal deaths were observed. The surviving offspring constitute 67.76% of the total conceptions. The mean number of conceptions in MDCTR (6.49) is more than that in MDCDP (6.13), the intergroup difference being insignificant. The fertility rate as measured by mean number of live births is more or less the same in both Madiga groups. The mean number of surviving offspring in MDCDP (3.96) is relatively lower than that in MDCTR (4.16), with non-significant difference. The mean number of total mortality found to be relatively lower in MDCDP (2.17) than in MDCTR (2.33), may be due to higher incidence of consanguinity in the latter group.

FERTILITY and mortality are fundamental determinants of population growth and are essential in the understanding of human society. Biological as well as socio-cultural factors are responsible for differential fertility and mortality among human populations. The biological factors consist of heredity, general health conditions, age, location, sex drive, fecundability, diseases, sterility, etc. Similarly, some of the socio-cultural factors are age at marriage, absence of spouse, widowhood or widow-remarriage, polygamy and postpartum sexual abstinence during certain seasons or ceremonies and permanent celibacy by some members of the population, etc. which also affect the population growth.

The Madigas, chosen for the purpose of this study, belong to the endogamous sub-division or sub-caste of Gampadhompti, the most predominant group in Andhra Pradesh (AP), including the study area covering Cuddapah and Chittoor districts. Madigas, divisible into about fifteen endogamous sub-castes, are leather-working scheduled castes found distributed almost all over the state. They are known by a number of names: Arundhatiyulu, Asprughyulu, Jambavulu, Gosangis, Matangas, Muttaranivaru, Harijans, Ettivaru, Tegavaru, Masthigalu, Pedda Intivaru, etc. However, terms like Arundhatiyulu, Gosangis, Jambavulu, etc. are included separately in the list of other scheduled castes[1]. The origin of Madigas is obscure. Physically, they are short- to medium-statured people with prominent cheekbones, oval elliptical face and hard constitution, dark brown skin colour, straight nose, black hair and brown eyes. An economically depressed community, the Madigas occupy the lowest position in the Hindu caste hierarchy. Their settlement is generally situated outside the main village. They mainly earn their livelihood by working as agricultural labourers. Besides, they practice their traditional occupation like tanning of skin and making of leather articles, buckets, belts, etc.

Demographic data were collected from 1053 Madiga families in Cuddapah and Chittoor districts of AP. A total of 31 villages surveyed from the above two districts comprised about 12 and 30% of the total population respectively. Research material for the study of population structure was collected from 69.45% of the families (532 families with 2605 persons) in Cuddapah district and 71.57% of the families (521 families with 2693 persons) in Chittoor district.

Information on demography was collected from Madiga families by the interview scheduled method. Data were collected using random sampling method through construction of bilateral genealogical tree of the possible extent. Information comprised the name to the head of the family, age of wife, husband and children, type of consanguineous relationship between spouses, marriage distance, marital status, menarcheal and menopausal ages, age at marriage, fertility and mortality. Appropriate statistical tools were employed in analysing the data.

Fertility and mortality are important demographic variables. In the present study, fertility has been measured by average number of live-births and mortality by prenatal deaths (foetal deaths), including abortions and stillbirths, post-natal deaths, including infantile deaths (neonatal and post-neonatal deaths), child deaths and deaths after 6 years of age to reproductive age. The means of fertility and mortality in consanguineous (C) and non-consanguineous (NC) matings of Madigas of Cuddapah district (MDCDP), Chittoor district (MDCTR) and pooled group are discussed. While computing the mean, ever pregnant women only are considered for the present purpose.

The results of total conceptions reported by 612 ever pregnant women from MDCDP and 672 from MDCTR, forming a total of 1284 women (all age groups) for the pooled group by parental consanguinity are shown in Table 1. In the pooled group, 93.21% of the total conceptions resulted in live births. The rest consist of prenatal deaths (pregnancy wastage), including abortions and stillbirths. Live births are broadly divided into already dead (post-natal deaths) and living children. Most of the live born (67.76%) are still alive, while the rest (25.45%) have already died. Deaths include neonatal deaths, post-neonatal deaths, child mortality and deaths after 6 to 15 years of age.

Considering the pooled data by mating types, it was observed that the pregnancy wastage is slightly higher in consanguineous than in non-consanguineous matings. Similarly, slight difference is also observed in fertility (live births).

Table 1. Results of total conception reported by 1284 selected married women

	Madiga group																	
	MDCDP						MDCTR						Pooled					
	C		NC		Total		C		NC		Total		C		NC		Total	
nception	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage
	1126	100.00	1702	100.00	2828	100.00	1729	100.00	1309	100.00	3038	100.00	2855	100.00	3011	100.00	5866	100.00
Pregnancy wastage	49	4.35	97	5.70	146	5.16	157	9.08	95	7.26	252	8.30	206	7.22	192	6.38	398	6.79
Abortion	30	2.66	61	3.58	91	3.22	76	4.40	43	3.29	119	3.92	106	3.71	104	3.46	210	3.58
Stillbirth	19	1.69	36	2.12	55	1.94	81	4.68	52	3.97	133	4.38	100	3.51	88	2.92	188	3.21
Live birth	1077	95.65	1605	94.30	2682	94.84	1572	90.92	1214	92.74	2786	91.71	2649	92.78	2819	93.62	5468	93.21
Already dead	354	31.44	490	28.79	844	29.84	404	23.37	245	18.72	649	21.36	758	26.55	735	24.41	1493	25.45
Neonatal death (0–28 days)	47	4.17	74	4.35	121	4.28	101	5.84	53	4.05	154	5.07	148	5.18	127	4.22	275	4.69
Post-neonatal death (28 days–1 yr)	153	13.59	237	13.92	390	13.79	120	6.94	62	4.74	182	5.99	273	9.56	299	9.93	572	9.75
Child mortality (1–6 yrs)	137	12.17	150	8.81	287	10.15	122	7.06	82	6.26	204	6.71	259	9.01	232	7.70	491	8.37
Death after 6 yrs to 15 yrs of age	17	1.51	29	1.71	46	1.63	61	3.53	48	3.67	109	3.59	78	2.74	77	2.56	155	2.64
Living children	723	64.21	1115	65.51	1838	65.00	1168	67.55	969	74.02	2137	70.34	1891	66.23	2084	69.21	3975	67.76

The proportion of living children in consanguineous matings is somewhat lower than non-consanguineous matings due to higher proportion of the dead children in the former group than the latter, showing higher mortality rate in the related matings.

Districtwise results show that the proportion of pregnancy wastage in MDCDP is lesser than that in MDCTR. However, the incidence of dead children in the former group is relatively higher than the latter group. The proportion of living children in MDCDP is slightly lower than that in MDCTR. Both groups together reveal higher proportion of living children in non-consanguineous matings than consanguineous matings, indicating higher mortality rate in the latter group.

The means of fertility and mortality calculated for consanguineous and non-consanguineous women of both groups of Madigas and pooled group are listed in Tables 2–4. Women of 'all families' showed consistently lower values than those of 'completed families'. The inclusion of women who are reproductively active perhaps caused this disparity. It is therefore worthwhile to limit the discussion only to 'completed families' from the point of reproductive variation. MDCDP and MDCTR groups consist of 108 (C: 43; NC: 65) and 128 (C:77; NC: 51) women who have completed their reproduction. Various components of fertility and mortality along with possible derivatives are discussed as follows.

The maximum number of conceptions in the pooled Madigas is 14, the mean number for the group being 6.33 ± 0.17. The mean number of conceptions is relatively higher in consanguineous than in non-consanguineous marriages. Districtwise examination shows the mean number of conceptions is higher in MDCTR than in MDCDP. This finding together with the occurrence of higher value of consanguineous matings of both groups reflect the homogeneity of the groups for the trait.

The fertility rate measured in terms of live-born children for the pooled group is 5.78 ± 0.16. The mean live births for consanguineous matings are relatively higher than those for non-consanguineous marriages. The difference in the mean live births between the MDCDP and MDCTR groups is negligible. Moreover, the fertility in both groups is relatively higher in the related than unrelated matings. The pooled group of Madigas shows moderately higher mean number of live births than the Balijas[2], Reddis[3], Malas[4] and Yerukalas[5].

According to Fisher[6], and Cavalli-Sforza and Bodmer[7], it is generally believed that the variance of progeny size is larger than the mean. The variance of live-born children (V_L: 6.24) is slightly larger than the mean ($\bar{X}_L$: 5.78) among the pooled Madigas. When fertile women (excluding '0' class) are considered, variance (V_L) of live-born children subsequently decreases. Infertility accounts for l8.22% of the total variance in the pooled group. The proportion of infertility contribution to variance (ICV) is relatively lower in consanguineous than in non-consanguineous marriages of the pooled group. Its proportion is slightly lower in MDCDP than in MDCTR.

The proportion of variance (V_L) to mean ($\bar{X}_L$), known as index of variability of fertility (IVF), is found to be 1.08 in the pooled group. It is lesser in consanguineous than in

Table 2. Fertility among Madiga groups

Madiga group	Type		Conception: Number of women	Conception: Maximum number	Conception: Mean ($\bar{X}$)	Conception: Variance (V_X)	Live birth: Mean ($\bar{X}_L$)	Live birth: Variance (V_L)	IVF ($V_L/\bar{X}_L$)	Surviving offspring: Mean ($\bar{X}_S$)	Surviving offspring: Variance (V_S)	PSO ($\bar{X}_S/\bar{X}_L$)	ICV
MDCDP	C	AF	249	11	4.52	6.76	4.33	6.56	1.52	2.90	3.56	0.67	12.58
		CF	43	11	6.21	6.40	5.91	6.36	1.08	4.02	3.28	0.68	15.91
	NC	AF	363	13	4.69	6.56	4.42	6.19	1.40	3.07	3.50	0.69	17.99
		CF	65	12	6.08	8.90	5.65	7.71	1.36	3.92	4.38	0.69	18.66
	Total	AF	612	13	4.62	6.65	4.38	6.34	1.45	3.00	3.53	0.68	15.80
		CF	108	12	6.13	7.91	5.75	7.19	1.25	3.96	3.94	0.69	17.57
MDCTR	C	AF	377	14	4.59	5.69	4.17	4.14	0.99	3.10	2.73	0.74	7.14
		CF	77	14	6.78	5.52	6.10	5.20	0.85	4.23	3.35	0.69	16.92
	NC	AF	295	12	4.44	4.88	4.12	3.83	0.93	3.28	2.82	0.80	6.03
		CF	51	12	6.06	6.96	5.35	5.29	0.99	4.06	4.60	0.76	21.54
	Total	AF	672	14	4.52	5.35	4.15	4.01	0.97	3.18	2.78	0.77	6.65
		CF	128	14	6.49	6.22	5.80	5.46	0.94	4.16	4.01	0.72	18.76
POOLED	C	AF	626	14	4.56	6.12	4.23	5.11	1.21	3.02	3.07	0.71	9.30
		CF	120	14	6.58	5.91	6.03	5.62	0.93	4.16	3.33	0.69	16.56
	NC	AF	658	13	4.58	5.91	4.28	5.15	1.20	3.17	3.21	0.74	12.63
		CF	116	12	6.07	8.05	5.52	6.77	1.23	3.98	4.48	0.72	19.93
	Total	AF	1284	14	4.57	5.97	4.26	5.14	1.21	3.10	3.14	0.73	11.01
		CF	236	14	6.33	7.02	5.78	6.24	1.08	4.07	3.99	0.70	18.22

AF, All families; CF, Completed families; IVF = Index of variability of fertility; PSO, Proportion of surviving offspring; ICV, Infertility contribution to variance (%).

Table 3. Total mortality and prenatal mortality among Madiga groups

Madiga group	Type		Number of women	Total mortality		Prenatal mortality (pregnancy wastage)	
				Mean	Variance	Abortion Mean ± SE	Stillbirth Mean ± SE
MDCDP	C	AF	249	1.62	2.18	0.12 ± 0.02	0.08 ± 0.02
		CF	43	2.19	3.48	0.16 ± 0.07	0.14 ± 0.06
	NC	AF	363	1.62	2.15	0.17 ± 0.02	0.10 ± 0.02
		CF	65	2.15	2.98	0.28 ± 0.07	0.15 ± 0.05
	Total	AF	612	1.62	2.16	0.15 ± 0.02	0.09 ± 0.01
		CF	108	2.17	3.17	0.23 ± 0.05	0.15 ± 0.04
MDCTR	C	AF	377	1.49	1.85	0.20 ± 0.03	0.21 ± 0.03
		CF	77	2.55	2.97	0.31 ± 0.08	0.38 ± 0.08
	NC	AF	295	1.15	1.61	0.15 ± 0.03	0.18 ± 0.03
		CF	51	2.00	2.50	0.33 ± 0.11	0.37 ± 0.08
	Total	AF	672	1.34	1.74	0.18 ± 0.02	0.20 ± 0.02
		CF	128	2.33	2.75	0.32 ± 0.06	0.38 ± 0.06
POOLED	C	AF	626	1.54	2.02	0.17 ± 0.02	0.16 ± 0.02
		CF	120	2.42	3.16	0.25 ± 0.05	0.29 ± 0.04
	NC	AF	658	1.41	1.90	0.16 ± 0.02	0.14 ± 0.02
		CF	116	2.09	2.76	0.30 ± 0.05	0.25 ± 0.03
	Total	AF	1284	1.47	1.95	0.17 ± 0.01	0.15 ± 0.01
		CF	236	2.25	2.98	0.28 ± 0.04	0.27 ± 0.03

non-consanguineous marriages. The MDCDP shows higher IVF than MDCTR, which may be due to the occurrence of lower incidence of sterility, resulting in the decrease of variance in the latter group.

The mean number of surviving children per mother is a balance of the inputs and outputs of the reproductive performance of a breeding group, and also a crude index of the population fitness that gives an idea about micro-evolution at intra and inter-population levels. The mean number of surviving offspring per mother among the pooled group of Madigas is 4.07 ± 0.13. It is slightly higher in the related than unrelated category. MDCDP shows lower mean number of surviving offspring than MDCTR.

The proportion of surviving offspring is lower in consanguineous (0.69) than in non-consanguineous (0.72) marriages. It is also somewhat lower in MDCDP than in MDCTR. However, the overall mean number of surviving offspring in either group as also in the pooled group, supports the view that the population is under numerical expansion.

Mortality is another factor which plays an important role in determining the growth of population. The mortality rate that occurs right from the early embryonic stage up to the reproductive age (15 yrs of age) is considered as total mortality. It is broadly divided into prenatal and post-natal mortality. The former, also known as 'pregnancy wastage', includes abortions and stillbirths, whereas the latter known as 'already dead children', includes infant mortality (0–1 yr), child mortality (1–6 yrs) and deaths after 6 to 15 yrs of age.

Infant mortality comprises neonatal deaths (0–28 days) and post-neonatal deaths (28 days–1 yr). Neonatal mortality is attributed to endogenous factors such as genetics influencing the growth of an organism, damage during gestation, birth injuries and conditions arising from delivery hazards. Post-neonatal deaths are largely attributable to exogenous factors such as infections, respiratory and digestive disorders, and neglect and faulty care of infant, and are therefore amenable to medical and environmental controls.

The mean number of total deaths (total mortality) from early embryonic stage up to reproductive age per woman among the pooled Madigas is found to be 2.25 ± 0.11. The overall mean total mortality is higher in consanguineous than non-consanguineous marriages. Our finding of higher mortality rate in related matings is in agreement with that earlier reported for the Kapus[8], Konda Reddys[9], Balijas[2], etc.

The total mortality is relatively lower in MDCDP than in MDCTR. The relatively higher incidence of consanguinity in MDCTR, perhaps resulted in high mortality.

Pregnancy wastage (prenatal mortality) is divisible into abortions and stillbirths. The mean numbers of abortions and stillbirths in the pooled Madigas are 0.28 ± 0.04 and 0.27 ± 0.03 respectively. The means are relatively higher in MDCTR.

Considering the post-natal mortality (already dead children), it has been found that the infant mortality, particularly post-neonatal deaths (0.59 ± 0.05), are more common than child mortality (0.55 ± 0.05) or deaths after 6 to 15 yrs of age (0.24 ± 0.03) among the pooled Madigas. This indicates

Table 4. Post-natal mortality among Madiga groups

Madiga group	Type		Number of women	Infant mortality: Neonatal death (0–28 days) Mean ± SE	Infant mortality: Post-neonatal death (28 days–1 yr) Mean ± SE	Infant mortality: Child mortality (1–6 yrs) Mean ± SE	Infant mortality: Death after 6 to 15 yrs of age Mean ± SE	Per cent offspring mortality
MDCDP	C	AF	249	0.19 ± 0.03	0.61 ± 0.05	0.55 ± 0.05	0.07 ± 0.02	32.87
		CF	43	0.26 ± 0.08	0.77 ± 0.10	0.67 ± 0.17	0.19 ± 0.06	31.89
	NC	AF	363	0.20 ± 0.02	0.65 ± 0.05	0.41 ± 0.04	0.08 ± 0.02	30.53
		CF	65	0.23 ± 0.06	0.71 ± 0.14	0.49 ± 0.12	0.29 ± 0.07	30.52
	T	AF	612	0.20 ± 0.02	0.64 ± 0.04	0.47 ± 0.03	0.08 ± 0.01	31.47
		CF	108	0.24 ± 0.05	0.73 ± 0.07	0.56 ± 0.10	0.25 ± 0.05	31.08
MDCTR	C	AF	377	0.27 ± 0.03	0.32 ± 0.04	0.32 ± 0.03	0.16 ± 0.02	25.70
		CF	77	0.42 ± 0.10	0.56 ± 0.10	0.66 ± 0.09	0.22 ± 0.06	30.49
	NC	AF	295	0.18 ± 0.03	0.21 ± 0.03	0.28 ± 0.03	0.16 ± 0.03	20.18
		CF	51	0.29 ± 0.10	0.33 ± 0.09	0.39 ± 0.10	0.27 ± 0.09	24.18
	T	AF	672	0.23 ± 0.02	0.27 ± 0.03	0.30 ± 0.03	0.16 ± 0.02	23.30
		CF	128	0.37 ± 0.08	0.47 ± 0.07	0.55 ± 0.07	0.24 ± 0.05	28.17
POOLED	C	AF	626	0.24 ± 0.02	0.44 ± 0.03	0.41 ± 0.02	0.12 ± 0.01	28.55
		CF	120	0.36 ± 0.02	0.64 ± 0.07	0.66 ± 0.06	0.21 ± 0.04	30.99
	NC	AF	658	0.19 ± 0.02	0.45 ± 0.03	0.35 ± 0.02	0.12 ± 0.01	25.89
		CF	116	0.26 ± 0.04	0.54 ± 0.06	0.45 ± 0.07	0.28 ± 0.05	27.73
	T	AF	1284	0.22 ± 0.01	0.45 ± 0.02	0.38 ± 0.02	0.12 ± 0.01	27.19
		CF	236	0.31 ± 0.03	0.59 ± 0.05	0.55 ± 0.05	0.24 ± 0.03	29.50

negligible progress in the control of diseases, particularly those of infectious origin that occur in the post-neonatal period and lack of proper medical care and malnutrition of the infants besides social and biological factors.

The per cent offspring mortality of the general population is 29.50, which is higher than that of the Balija population[2].

The two groups of Madigas with moderately high fertility and mortality present a picture of an expanding population. The economically poor and illiterate Madigas do not adopt birth-control methods and perform early marriages mostly with their relatives leading to high fertility, which in turn reflects in high mortality. Poverty makes it impossible for many parents to provide adequate resources to ensure the health of their children. The general causes of death of the children are fever, vomitting, dysentery, diarrhoea, inflammation, feeding complications, etc. Due to inadequate medical facilities in these areas, most people fail to get treatment leading to death. Heredity, general health condition, age, fecundability, diseases, sterility, etc. are some of the biological factors that cause high fertility and mortality among the Madigas. Thus biological and socio-economic factors are highly responsible for high fertility and mortality in the Madiga populations.

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Received 25 October 2004; revised accepted 15 January 2005