

Opium Consumption and its Indirect Effect on the Fertility of Women in Desert Villages of Rajasthan

J. Lakshminarayana^{1*}, K.N. Misra², Madhu B. Singh¹ and R.K. Kalundha¹

¹ Desert Medicine Research Centre, ICMR, New Pali Road, Jodhpur 342 005, India

² Department of Statistics, Gombe State, Nigerian University, Nigeria

Abstract: The study was carried out in 1998 in two rural desert districts namely, Barmer and Bikaner of Rajasthan where the consumption of opium or doda is very much prevalent due to social and cultural customs in the area. The median age of the addicts was 41.1 years. The mean age of the opium/doda addiction, the mean age at marriage, mean age at effective marriage and duration of consumption of opium have been found out. The indirect effect of opium and doda addiction by men and the changes in the fertility of their spouse in terms of parity has been estimated with the help of a discrete probability model. The probability model has been estimated with closed birth interval technique. The nature of variation of addiction of opium/doda by the husbands and its effect on the wives fertility with respect to age, duration of consumption and parity was estimated.

Key words: Opium addiction by men, indirect effect, fertility, women, desert, Rajasthan.

The opium consumption is traced in the desert region of Rajasthan state right from the Mughal period to stop bleeding of wounds during war (Purohit and Vyas, 1982). Opium (*Papaver somniferum*) is a derivative of the milk of a poppy fruit. It is usually available in a chocolate colored gum form prepared by drying the poppy fruit milk. The present study was carried out in two rural desert districts Barmer and Bikaner, where the consumption of opium or doda is very much prevalent. The population is addicted due to social and cultural factors associated with it. In this paper we have attempted to see the indirect effect of opium/doda consumption on the fertility of wives among the addicts over a period of time. Opium is also used for various ailments like cough, diarrhea, insomnia, etc. Due to its increasing demand from the pharmaceutical firms in India, and also from other countries, the opium is cultivated under strict supervision. Opium consumption causes several health problems like stomach pain, upper respiratory tract problem, body and joint pains. In the rural areas even mothers apply to the upper palate to the young infants/children to prevent them from crying, so that they can do the work. In some areas the powdered opium seeds are mixed in vegetables to improve the taste. The consumption habit has spoiled the economic conditions of several families (Annual Report, 1993). The opium consumption in the beginning is said to provide pleasure and

relaxation. It also accelerates sexual desire, but in the long run it starts showing its adverse effects (Annual Report, 1998). Among males it retards the sperm counts, which in turn indirectly affects the fertility (Lakshminarayana and Misra, 2000). This fact has also been reported in a study in Pakistan (McGlothlin *et al.*, 1978; Anonymous, 1977). The researchers have also reported that the prolonged use of opium causes degradation in the heads and tails of the male sperms besides fragmentation of plasma membranes, numerical aberrations and cytoplasmic droplets (Anonymous, 1979; El-Gothami and El-Samahy, 1992; McGlothlin Mubhashar *et al.*, 1978). One of the objectives is to measure the fecundability of those women whose husbands consume opium.

Material and Methods

To examine the impact of opium consumption by husbands on the fertility of spouses, the data were collected from 312 randomly selected couples from 12 villages of Bikaner and Barmer districts in western Rajasthan. The information was collected from child-bearing age of women whose husbands were opium/doda addicts. These two districts were selected because of high consumption of opium here. The data were collected on pre-designed schedules and were analyzed after consistency checks and reliability of the data. The fecundability of women have been computed and tested by a statistical model developed for closed birth interval. The data were analyzed using EPI-INFO 6.0 Ver. By CDC Atlanta, free download and

*E-mail: drjln_58@rediffmail.com

SYSTAT-12 packages. The statistical model was tested by Chi-square test for association and goodness of fit of opium and age group.

The fecundability, a biological fertility parameter associated with every women of child-bearing age, is defined as the probability of conception of a married woman in one menstrual cycle. This parameter cannot be observed directly. However, it can be estimated, indirectly, by incorporating it in a suitable probability model. A number of probability models have been developed for the purpose. In the present study only the data on last and last-but-one closed birth interval has been used to estimate the fecundability. The brief description of the model is given below. The Model is based on the following assumptions.

are: (a) the post-partum amenorrhoea following the live birth of the i^{th} child (M_i), (b) the spells of menstruating intervals in T_i (both the numbers and duration in each), (c) the periods of non-susceptibility associated with the reproductive wastages between the i^{th} and $(i+1)^{\text{th}}$ birth (the total number and duration in each), and (d) the period of pregnancy associated with the live birth.

Under these assumptions stated a above the unconditional probability generating function $H_i(s)$ of the i^{th} closed birth interval T_i has been obtained and equated the first two partial derivatives of $H_i(s)$ at $s=1$ to the first two factorial moments of T_i and thereby obtaining the following two equations.

$$\left. \frac{\delta H_i(s)}{\delta s} \right|_{s=1} = E(T_i) = 9 + (\mu_i - \lambda_i) + \frac{1}{\theta_i} \left(\lambda_i + \frac{b_i}{s_i - 1} \right) \quad \dots 1$$

$$\begin{aligned} \left. \frac{\delta^2 H_i(s)}{\delta s^2} \right|_{s=1} &= E(T_i^2) - E(T_i) \\ &= [72 + 18(\mu_i - \lambda_i) - 2\mu_i\lambda_i + 2\lambda_i^2 + \pi_i - \rho_i] \\ &+ \frac{1}{\theta_i} \left[2\lambda_i(9 + \mu_i) + \rho_i - 4\lambda_i^2 + 2\frac{b_i}{a_i - 1} (9 + \mu_i - 2\lambda_i) \right] + \\ &\left| \frac{1}{\theta_i^2} \left[2\lambda_i^2 + 4\lambda_i \frac{b_i}{a_i - 1} + \frac{2b_i(b_i + 1)}{(a_i - 1)(a_i - 2)} \right] \right| \quad \dots 2 \end{aligned}$$

- The completed months of a pregnancy associated with live birth is 9 months. Though some variations exist, the same have not been taken into consideration under the study.
- The fecundability remains same every month during her susceptible state in the interval between i^{th} and $(i+1)^{\text{th}}$ live birth denoted by T_i .
- Over the women in interval T_i , it is assumed that the fecundability parameter is distributed as a beta variate with parameter a_i and b_i .
- Let θ_i be the probability of conception between i^{th} and $(i+1)^{\text{th}}$ live births. It is assumed that this probability changes only from parity to parity, however, remaining the same for all women for all conceptions occurring within any specified birth interval.
- The four components of a birth interval T_i listed below are all mutually exclusive and stochastically independent of each other. They

where, μ_i λ_i stand for the mean of M_i and L_i (the duration of the non-susceptible period), respectively, and $\rho_i = (\xi_i^2 + \lambda_i^2 - \lambda_i)$ where λ_i is the mean of L_i , and ξ_i is the variate of L_i where $\pi_i = (o_i^2 + \mu_i^2 - \mu_i^2)$ o_i^2 is the variance of M_i .

The expressions for $E(T_0^2)$ and $E(T_0)$ can be obtained by putting $\mu_i = 0$ and $\pi_i = 0$ in the expressions (1) and (2). The symbol T_0 denotes the interval from effective marriage to the first live birth.

The expressions (1) and (2) involve seven parameters a_i , b_i , μ_i , o_i^2 , $\pi_i = (o_i^2 + \mu_i^2 - \mu_i)$, $\rho_i = (\xi_i^2 + \lambda_i^2 - \lambda_i)$ and θ_i . The parameters μ_i , ξ_i , o_i^2 and θ_i can be observed in some specific population with the help of a suitably collected data and the empirical values thus obtained can be equated with their counterparts in (1) and (2), thereby reducing the equations in two variables a_i and b_i only. From these two equations, the estimated values of a_i and b_i can be obtained

Table 1. Estimates of mean fecundability according to different age groups of consumers

Present age (yrs.) of opium consumption	N (312)	E(T)	E(T ²)	μ	Σ	a	b	$P = \frac{a}{a+b}$
<30	18	26.22	694.6667	7.45	36.25	6.5907	46.3640	0.1245
30-40	192	34.93	1227.4635	7.45	36.25	33.9289	-563.4723	0.0568
≥40	102	42.21	1790.0686	7.45	36.25	-5.1548	-139.6160	0.0356
W = (1-θ) = 05		$\lambda = 5$ months		$\rho = 34.0625$				

for the i^{th} parity interval. These estimated values will help in estimating the average fecundability in the parity interval T_i using the theoretical result.

$$E(p_i) = a_i / (a_i + b_i) \quad \dots 3$$

Thus technique has been adopted to compute the fecundabilities in various parity intervals of the women with the help of the data in our study. An indirect effect on the fecundability of women due to opium consumption by their husbands was estimated by comparing the fecundability of the women using the procedure of closed birth intervals as discussed above. Further the possible relationship of fecundability with some important variables like age, parity, age of starting of opium/doda consumption, duration of consumption, etc., has also been examined. In application of the model the values of w_i , λ_i , and ρ_i were taken to be 0, 1, 5 months and 34.0625, respectively, which was observed in another study in a neighboring population (Srinivasan, 1972; McGlothlin *et al.*, 1978).

Results and Discussion

The majority of the husbands consuming opium or doda were in the age group of 35-40 years (40.4%), followed by 40-45 years (25.6%) and 25-30 years (21.2%). The mean age at marriage of the opium/doda addicts has been found to be 12.42 years. The mean age at effective marriage is 20.5 years. Around 50.6% of the males started consuming opium in the age group of 20-25 years followed

by 43.3% at 30-35 years, and the remaining 6.1% were in other age groups. The Average age of the opium/doda consumers is 29.5 years. Around 32.7% consumers had up to four children and the average family size was 3. The conditions are such that the Government has managed to supply them opium or doda through its ration shops. It has been observed that on an average 11.8 g of crude opium is consumed twice a day by the individuals, once in the morning and in the evening. The daily consumption of doda by an individual is 210 g. The estimated prevalence of opium/doda addiction was 12.6% in Bikaner and 14.6% in Barmer, which is around 6.9% and 8.4% higher in the same region reported earlier (Lakshminarayana and Singh, 2009; Misra and Ramnath, 2000).

The estimates of fecundability were categorized into three broad age groups namely <30, 30-40, ≥40 years (Table 1). The fecundability estimates appear to be decreasing with advancing age thus suggesting an inverse relationship. The fecundability estimates ranged between 0.0355 and 0.1245 in the age groups.

The persons who started consuming opium/doda at an early age i.e., < 25 years had the fecundability estimates of 0.1327 and those who started at 25-30 years age had an estimate of 0.1190 (Table 2). The fecundability estimates decreased as the age advanced. This suggested that opium/

Table 2. Estimates of mean fecundability according to different starting age groups of the consumers

Age (yrs.) at start of opium consumption	N (312)	E(T)	E(T ²)	μ	σ	a	b	$P = \frac{a}{a+b}$
<25	17	27.82	987.5882	7.45	36.25	3.0431	19.8856	0.1327
25-30	158	28.55	980.8671	7.45	36.25	3.4752	25.7176	0.1190
≥30	137	25.45	754.6058	7.45	36.25	3.1674	16.4726	0.1613
W = (1-θ) = 05		$\lambda = 5$ months		$\rho = 34.0625$				

Table 3. Estimates of mean fecundability according to different parity groups

Parity	N (312)	E(T)	E(T ²)	μ	σ	a	b	$P = \frac{a}{a+b}$
<3	30	35.43	1829.23	7.45	36.25	3.3325	38.6570	0.0794
3-5	256	26.39	790.89	7.45	36.25	3.5352	21.4119	0.1417
≥5	26	25.12	684.73	7.45	36.25	3.7781	20.2886	0.1570

Table 4. Estimates of mean fecundability according to duration of consumption

Duration of consumption (years)	N (312)	E(T)	E(T ²)	μ	σ	a	b	$P = \frac{a}{a+b}$
<5	65	25.38	783.3221	7.45	36.25	2.9342	14.5782	0.1675
5-10	136	27.75	871.4853	7.45	36.25	3.8794	27.8442	0.1223
≥10	111	27.45	952.3333	7.45	36.25	3.0367	19.1448	0.1369

doda addiction in the long run adversely affected sexual functioning of the consumers and chances of women to conceive.

The estimates of fecundability of women classified under three groups with respect to parity are shown in Table 3. There are many studies that examined the changes in fecundability with respect to parity (Misra and Ramnath, 2000). We have calculated the behavior of average fecundability estimates in various parities of the opium consumers by using the model described above for three parity groups namely < 3, 3-5 and ≥ 5 children in the family. The estimates of average fecundability increased with increasing parity. The estimates for the three parities are 0.0794 for <3, 0.1417 for 3-5 and 0.1570 for ≥ 5.

The estimates of fecundability have been calculated for various durations of opium consumption to examine its indirect effect on the fecundability. Based on duration of consumption they were placed in three groups i.e. < 5 years, 5-10 years and ≥ 10 years. The estimates of fecundability for these three categories were 0.1675 for <5, 0.1223 for 5-10 and 0.1369 for ≥ 10 years. (Table 4). These values do not show any trend for viable conclusions. A study with large sample size is needed to establish effects of opium/doda consumption on fertility

Acknowledgements

We thank Officer-in-charge, Desert Medicine Research Centre, Jodhpur, for facilities, staff of the centre for technical support and people of rural areas for their support and co-operation during the study.

References

- Anonymous 1977. *Drug Addiction: An Overview*. Indian Council of Medical Research.
- Anonymous 1979. *National Commission of Drug Abuse in India*. Ministry of Health and Family Welfare, Govt. of India, New Delhi.
- Anonymous 1993. *Annual Report*, Desert Medicine Research Centre, Jodhpur.
- Anonymous 1998. *Annual Report*. Desert Medicine Research Centre, Jodhpur.
- Correia, M.A., Oliveria, A.P., Almeida, J.P., Sing, C.K. and Nobrega, J.D. 1995. Drug addiction mothers. *Acta Medica Portuguesa* 8(1): 5-10.
- El-Gothamy, Z. and El-Samahy, M. 1992. Ultra structure sperm defects in addicts. *Journal of Fertility and Sterility* 57(3): 699-702.
- Lakshminarayana, J., Misra, K.N. and Kalundha, R.K. 2000. Opium consumption and fecundability. In *Proceedings of Indian Society for Medical Statistics (ISMS)*, pp. 875-889. JALMA, Agra.
- Lakshminarayana, J. and Singh, Madhu B. 2009. Opium addiction among rural population in desert districts of Western Rajasthan some observations from the study *Journal of Human Ecology* 25(1): 1-4.

- McGlothin, W., Mubhashar, M.H., Shafique, M. and Hughes, P.H. 1978. Opium use in two communities of Pakistan. A comparison of urban and rural patterns. *Bulletin of Narcotics* 30: 1-14.
- Misra, K.N. and Ramnath, T. 2000. Some observations on fecundity from the desert regions of Rajasthan State. *Journal of Family Welfare* 46(2): 51-55.
- Purohit, D.R. and Vyas, B.R. 1982. Opium de-addiction camp: A follow up study. *Journal of Clinical Psychiatry* 6(1): 55-61.
- Srinivasan, K. 1972. Analytical models for two types of birth intervals with applications to Indian population. *Ph. D. Thesis*, University of Kerala.