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Possible deleterious effects of consanguinity in selected area in Tamil Nadu

CP Prakasam
Retired Professor from Department of Mortality and Public Health, International Institute for Population Sciences, Deonar, Mumbai, Maharashtra, India

Abstract
Consanguineous marriages (Father's sister's daughter or mother's brother's daughter) are predominant in Southern states. An attempt is to study the prevalence of consanguineous marriages and its possible deleterious effect on pregnancy outcome in selected community in Tamil Nadu by collecting data from a household survey in Chidambaram Tehsil, covering 8 sample villages with 2665 households. Results revealed that the prevalence of consanguineous marriages found to be 26.79 percent and 7.6 percent women experienced spontaneous abortions. There is no significant association between marital relationship and place of residence with respect to spontaneous abortions however stillbirths found to be significantly higher among women with consanguineous marriages(χ^2 =2.5076, P<.001, RR: 1.45). 5.3 percent disability was observed among consanguineous marriages against 2.6 in non-consanguineous marriages (χ^2 =11.8752, P<.001, RR: 1.39). The proportion of child loss found to be more among consanguineous marriages and survived children around 8 percent had mental retardation, and 22.7 children became handicapped.

Keywords: consanguinity, marriage, pregnancy loss, deleterious effect

Introduction
All Human societies however primitive or geographically isolated, prohibits the mating of first-degree relatives, namely the mating between parents and children and brothers and sisters. However uncle-nice/aunt-nephew marriages (Consanguineous marriage) are predominant in developing countries like India, Pakistan and Middle East countries.

The National Family Health Survey (NFHS-4) [1] shows consanguineous marriages in India from Father Side and Mother Side 4.30, 4.31 percent respectively. Among the Indian States, from Father Side and Mother Side the percentage of consanguineous marriages is high in Andhra Pradesh (11.6%, 12.1%), Telangana (12.7%, 8.2%), Karnataka (9.1%, 13.1%) and Tamil Nadu (10.5%, 13.2%).

Research study carried out by Yasmin, Naidu JM *et al.* (1997) [2], revealed that among Kotia tribal, Consanguinity as father's sister's daughter or mother's brother's daughter found to be 27.5 percent and 20.8 percent respectively. In Karnataka state, by analyzing 600 tribal households, Mutharayappa (1993) [3] revealed that 77.3 percent of Jenukuruba tribe and 22.3 percent of Kadukruba tribe have consanguineous marriages and cross cousin marriages are preferred between both tribes. In Chittoor district of Andhra Pradesh, in Kamma community, it was observed consanguineous marriages were common practice and identified birth deformities (Chandrasekhar, A *et al.* 1993) [4] and a community study carried out by Rajeswari, GR *et al.* [5] revealed that in Yadava and Vadabalija of Vishakaptanam of Andhra Pradesh, consanguineous marriages were common practice leading to birth deformities.

Consanguineous marriage and deleterious effects has been studied by Bittles (1994) [6], Uberoi (1994) [7], Rao *et al.* (1971) [8], Rao (1983) [9] and other researchers, noticed that consanguineous marriage relations present one or other congenital abnormalities such as Cleft lip, Cleft palate or both or club foot, Microcephaly, Anencephaly, Hydrocephaly etc. At the childhood, metabolic disorders causing difficulty in feeding, refusal to feed, respiratory difficulties (Tachypnoca), central nervous system problems (Lethargy and hypotonic) and seizures. At later childhood stage it has been observed that the child may suffer with blindness, deafness, Psychological retardation, stunted growth, epileptic fits, scoliosis, sickle cell anemia or mental retardation [10]. By using the data on all single birth in Norway between 1967 and 1994, Stoltenberg C *et al.* (1999) [11] observed the risk of stillbirth and infant death in marriages between first cousins. It has been observed that in non-consanguineous marriage, the risk of early death for the subsequent sibling was 17 per 1000 if previous child survived and 67 per 1000 if previous child died before one year of age and for parents who were first cousins, the risks of early death of the subsequent sibling was 29 per 1000 if the previous child survived and 116 per 1000 if the previous child died.

Keeping in view of the above research work on prevalence of consanguineous marriages and its deleterious effects, an attempt is made to understand deleterious effect due to consanguineous marriage in Tamil Nadu with the following specific objectives.

1. Consanguineous marriages among selected communities in Tamil Nadu and its impact on sibling survival
2. Possible deleterious effects of consanguineous marriages (Viz: Pregnancy loss, Child loss, disability) and progress of intergeneration consanguineous marriages among selected communities in Tamil Nadu.

2. Material and Method
This research work is based on the data collected from a household survey [12] conducted by the authors in

Chidambaram Tehsil, Tamil Nadu covering representative sample of 2665 households from 8 sample units (6 villages, 2 urban settings). The household survey was carried out in three stages, by identifying the sample households through house listing in first stage. Second stage through rapid assessment survey was conducted to establish the relationship between married women and their husband. Third stage through predesigned questionnaire data was collected. All these process carried out during 2007-08 and completed in six months duration by taking proper concern from the respective authorities and head of the household and respondent women. Information about socio economic characteristics of the household, type of marriage (Consanguineous and non-Consanguineous), religion, and level of education, reproductive history, type and relationship with husband before marriage, previous and before previous generation has been collected from the currently married women. Also pregnancy out come and deleterious effect of consanguineous marriages has been collected. By using SPSS Package, Bivariate tables were extracted and chi-square test and relative risk has been calculated to establish association between selected variables and consanguineous and non-consanguineous marriage.

3. Results

3.1 Marital relationship and Background characteristics

The Background characteristics of the respondent women have been cross classified with marital relationship viz: "Non consanguinity" and "Consanguinity" and the results shows that (Table 1) around 10 percent of women were less than 24 years of age among consanguineous and non-consanguineous marriage relationship. Around 87 percent of women with non-consanguineous marital relationship found to have age at first menstruation less than 15 years where as 87.2 percent among consanguineous women. There is no significant association between marriage pattern and first menstruation (χ^2 =1.20, NS). Around 24 percent of women with consanguineous relationship were illiterate and only 5.3 percent studied up to degree level, whereas double the percentage (10.5 percent) of women with non-consanguineous marriage relationship were studied up to degree level and there is significant association between education level of respondent women and marital relationship (χ^2 =32.16, P<.001). This is true in case of education level of husband (χ^2 =26.70 P<.001).However religion wise, marital relationship could not show any significant association, reveals that in the study area non consanguineous and consanguineous marriages given equal importance, independent of its consequences on outcome of siblings. Consanguineous marriages found to be more among rural women (50.8 percent) than urban (χ^2 =14.74, P<.001).

Table 1: Background characteristics of currently married women by marriage relationship in Chidambaram Tehsil, Tamil Nadu

Background Characteristics	Marital relationship: Consanguinity			
	No	Yes	Total	
	n= 1951	n=714	n=2665	Chi-square
Current Age of Women				
<15	5 (0.3)	3(0.4)	8(0.3)	
15-24	173(8.9)	67(9.4)	240(9.0)	
25-34	618(31.7)	217(30.4)	835(30.4)	
35-44	597(30.6)	207(29.0)	804(30.2)	
45+	558(28.6)	220(28.6)	778(29.2)	
Age at Menarche				
<13	696(35.7)	271(38.0)	967(36.3)	
13-15	995(51.0)	351(49.2)	1346(50.5)	
16+	260(13.3)	92(12.8)	352(13.1)	χ^2 = 1.20 NS
Religion of Head of Household				
Hindu	1863(95.5)	684(95.8)	2547(95.6)	
Christian	53 (2.7)	15(2.1)	68(2.6)	
Muslim	35 (1.8)	15 (2.1)	50(1.9)	χ^2 =1.04 NS
Education level of respondent women				
Illiterate	341(17.5)	173(24.2)	514(19.3)	
Primary Completed	383(19.6)	162(22.7)	545(20.5)	
Secondary Completed	876(44.9)	293(41.0)	1169(43.9)	
Higher Sec. Completed	147 (7.5)	48(6.7)	195(7.3)	
Degree and above	204(10.5)	38(5.3)	242(9.1)	χ^2 =32.16**
Education level of Husband				
Illiterate	157(8.0)	70(9.8)	227(8.5)	
Primary Completed	315(16.1)	166(22.4)	475(17.8)	
Secondary Completed	902(46.2)	327(45.8)	1229(46.1)	
Higher Sec. Completed	166(8.5)	56(7.8)	222(8.3)	
Degree and above	411(21.1)	101(14.1)	512(19.2)	χ^2 =26.70**
Place of Residence				
Urban	1122(57.5)	351(49.2)	1473(55.3)	
Rural	829(42.5)	63(50.8)	1192(44.7)	χ^2 =14.74**

NS=Not significant, ** =P<.001

3.2 Marital relationship and Pregnancy loss

Pregnancy loss has been identified as spontaneous abortion, stillbirths collected from the reproductive history of all women according to marital relation and analyzed. Feotal loss, which occurred at or before 28 weeks of gestation, considered as spontaneous abortion. Information of spontaneous abortion according to marital relationship by place of residence is given in Table 2 and 7.6 percent of women with consanguineous marriages experienced spontaneous abortions than non-consanguineous women. In rural areas percentage of women experiencing spontaneous abortion found to be more or less same for both the groups. In urban areas higher percentage of spontaneous abortion (8.3) among women with consanguineous marriage (Table 2) has been observed. There is no significant association between marital relationship and place of residence with respect to spontaneous abortions in the study area.

Table 2: Pregnancy loss (Spontaneous Abortion) according to marital relationship according to place of residencies in Chidambaram Tehsil, Tamil Nadu

Place of Residene	Spontaneous abortion	Marital Relationship: Consanguinity		Total
		No	Yes	
Urban	No	1046 (93.2)	322 (91.7)	1368(92.9)
	Yes	76 (6.8)	29 (8.3)	105(7.1)
	Total	1122(100.0)	351 (100.0)	1473(100.0)
χ^2 = 0.8948, NS				
Rural	No	773(93.2)	338(93.1)	1111(93.2)
	Yes	56(6.8)	25(6.9)	81(6.8)
	Total	829(100.0)	363(100.0)	1192(100.0)
χ^2 =0.0069, NS				
Total	No	1819 (93.2)	660 (92.4)	2479 (93.0)
	Yes	132 (6.8)	54 (7.6)	186 (7.0)
	Total	1951 (100.0)	714 (100.0)	2665 (100.0)
χ^2 =0.5118, NS				

NS=Not significant, ** =P<.001

Percentage of stillbirths according to marital relationship in Urban, Rural areas of Tamil Nadu (Table 3) revealed that around 3-4 percent of stillbirths are among consanguineous marriages. In the study area stillbirths found to be significantly higher among women with consanguineous marriages (3.8) than non- consanguinity (2.6) (χ2 =2.5076, P<.001, RR: 1.45**)**

The percentage of stillbirths among consanguineous marriages in rural area (4.4) found to be higher than urban area (3.1). In Urban area pregnancy outcome (stillbirths) with marital relationship (consanguineous marriage and non-consanguineous) shows that the percentage of stillbirths is significantly higher among urban women with consanguineous marriage than among non-consanguineous marriages **(**χ^2 = 2.0044, P<.001, RR: 1.67) however in rural area pregnancy outcome (stillbirths) among women with consanguineous marriage had 1.22 times higher risk than non-consanguineous marriage.

Table 3: Percentage of still births according to marital relationship by place of residencies in Chidambaram Tehsil, Tamil Nadu

Place of Residence	Pregnancy outcome	Marital Relationship: Consanguinity		Total
	Still Birth	No	Yes	
Urban	No	1101 (98.1)	340 (96.9)	1411 (97.8)
	Yes	21(1.9)	11 (3.1)	32 (2.2)
	Total	1122 (100.0)	351 (100.0)	1473 (100.0)
χ^2 = 2.0044, P<.001, Relative risk: 1.67, CI 0.8154- 3.4385				
Rural	No	799 (96.4)	347 (95.6)	1146 (96.1)
	Yes	30 (3.6)	16 (4.4)	46 (3.9)
	Total	829 (100.0)	363 (100.0)	1192 (100.0)
χ^2 =0.4234, NS, Relative Risk: 1.22, CI 0.6724- 2.2026				
Total	No	1900 (97.4)	687 (96.2)	2587 (97.1)
	Yes	51 (2.6)	27 (3.8)	78 (2.9)
	Total	1951 (100.0)	714 (100.0)	2665 (100.0)
χ^2 =2.5076, P<.001, Relative Risk : 1.45, CI: 0.9146-2.2882				

NS=Not significant, ** =P<.001

3.3 Marital relationship and Child loss

Child loss have been analyzing by number of children ever born (CEB) and children surviving (CS). The ratio of children surviving by children ever born (CS/CEB) has been calculated to show child loss by marital relationship. If the ratio equal to 1, then there is no loss, otherwise women experiencing child loss in her reproductive life. If the ratio equal to 1, then there is no loss, otherwise women experiencing child loss in her reproductive life.The proportion of child loss found to be more among consanguineous marriages than non-consanguinity (Fig.1) further among the consanguineous marriages women experiencing more than two children loss

than non-consanguineous women. Women who had more number of deliveries had experienced more child loss (>two). It was evident that surviving children (Fig 1) found to be less among consanguineous marriages than non-consanguinity and increases with more number of deliveries (>two).

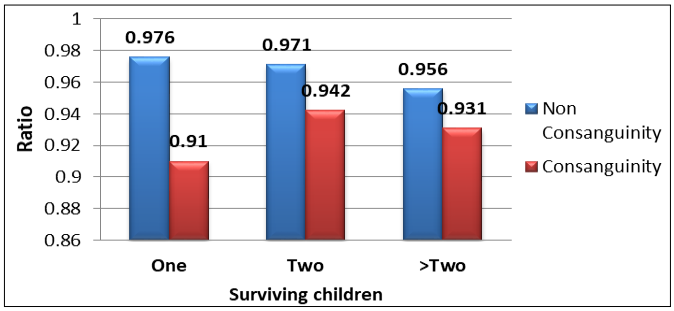

Fig 1: Child Survival by Marital Relationship

3.4 Marital relationship and Disability of the offspring

It has been observed that out of total sample women, 3.3 percent expressed that they had given birth to child with disability. Research Studies in India and other places showed that 2-3 percent of new born infants through consanguineous marriage relations present one or the other congenital abnormalities[10].

In the study area it has been observed that out of total women 3.3 percent of women expressed that they had child with congenital deformity (Table 4).The disability cross classified with marital relationship shows (Table 4) that 5.3 percent disability was observed among consanguineous marriages as against 2.6 percent in non-consanguineous marriages (χ^2 =11.8752**,** P<.001, RR: 2.04**).** In urban areas women reported disability among their sibling was significantly higher among consanguineous marriages than in non-consanguineous marriages (χ^2 = 12.4589, P<.001, RR: 2.69**).**

Table 4: Number and Percentage of women reported disability among sibling according to marital relationship by place of residencies in Chidambaram Tehsil, Tamil Nadu

Place of Residence	Disability	Marital Relationship: Consanguinity		Total
		No	Yes	
Urban	No	1097 (97.8)	330 (94.0)	1427 (96.9)
	Yes	25 (2.2)	21 (6.0)	46 (3.1)
	Total	1122 (100.0)	351 (100.0)	1473 (100.0)
χ^2 = 12.4589, P<.001, Relative risk: 2.69, CI: 1.522 - 4.7368				
Rural	No	803 (96.9)	346 (95.3)	1149 (96.4)
	Yes	26 (3.1)	17 (4.7)	43 (3.6)
	Total	829 (100.0)	363 (100.0)	1192 (100.0)
χ^2 =1.7373, NS, Relative risk:1.49, CI:1.49, CI: 0.8205 – 2.7175				
Total	No	1900 (97.4)	676 (94.7)	2576 (96.7)
	Yes	51 (2.6)	38 (5.3)	89 (3.3)
	Total	1951 (100.0)	714 (100.0)	2665 (100.0)
χ^2 =11.8752, P<.001, Relative risk:2.04, CI: 1.3957- 3.0715				

3.5 Type of Disability

Out of 89 women who expressed their sibling had disability, further reasons and their survival status has been probed. Number of deformities and deaths due to consanguineous marriages revealed (Table 5) that nearly 13 percent of children born out of consanguineous relation died with breathlessness, fits and died within a day that was unable to take feed. Those who had survived, around 8 percent of children had mental retardation (mad), 22.7 percent children became handicapped and 17.7 percent are not able to walk/not active. Other reasons of disability faced by the children born out of consanguineous relation were deaf, dumb, visual impairment, chest pain and dry skin.

Table 5: Type of disability and type of survival status among siblings due to consanguineous marriages in Chidambaram Tehsil, Tamil Nadu

Type of Disability	Total	Yes Consanguineous
Died		
Breathlessness and died	3 (3.4)	2 (3.2)
After one day child dead, not able to take feed	7 (7.9)	5 (8.1)
8 Months old child died with fits	1 (1.1)	1 (1.6)
Survived:		
Affected with polio	3 (3.4)	2 (3.2)
Bend legs	3 (3.4)	2 (3.2)
Chest pain	1 (1.1)	1 (1.6)
Deaf (1), Dumb (1), Both Deaf and Dumb (6)	11 (12.3)	8 (12.9)
Dry Skin	1 (1.1)	1 (1.6)
Eye Defect	3 (3.4)	2 (3.2)
Handicapped	21 (23.6)	14 (22.7)
Heart Abnormal & Breathing Trouble	7 (7.9)	5 (8.1)
Mad (mental disorder)	11 (12.3)	8 (12.9)
Not Active/ Not Walking	17 (19.1)	11 (17.7)
Total	89 (100.0)	62 (100.0)

3.6 Intergeneration Consanguineous Marriages (Trend)

An attempt is made to understand the practice of consanguineous marriages among the women in the study area. To capture the data, information regarding the marriage relation of their father, mother, grandfather and mother, great grandfather and mother from husband side, women side has been collected. Present generation information about the marriage relation and disability has been listed in the Table 6, which gives trend in consanguineous marriages in the community.

It has been observed that percentage of consanguineous marriages in the first generation husband side and women side found to be around 16.4 percent (Table 6). Further percentage of consanguineous marriages in urban area found to be more in the first generation husband side (18.1) than women side (16.2).Further it has been observed that consanguineous marriages next to next previous generation from husband and wife side found to be around 55 percent. As the generation changes, percentage of consanguineous marriages declines from 55.2 in next to next previous generation to 16 percent in the present generation. This declining trend is observed to be same in Husband and wife side. Declining trend in consanguineous marriages, both in urban and rural areas was observed (Table6) and faster in rural areas than in urban areas.

Table 6: Consanguineous marriage relation between generations by place of residence in Chidambaram Tehsil, Tamil Nadu

Present eneration	Husband			Wife		
Place of Residence	Previous Generation Father-Mother relation		Total	Previous Generation Father-Mother relation		Total
	Yes Consanguineous	No Consanguineous		Yes Consanguineous	No Consanguineous	
Urban	267(18.1)	1206(81.9)	1473	238 (16.2)	1235 (83.9)	1473
Rural	166 (13.9)	1026(86.1)	1192	199 (16.3)	993 (83.3)	1192
Total	433(16.2)	2232(83.8)	2665	437 (16.4)	2228 (83.6)	2665
	Next Previous Generation			Next Previous Generation		
Urban	772 (52.4)	701(47.6)	1473	857 (58.2)	616 (41.8)	1473
Rural	575 (48.2)	617 (51.8)	1192	630 (52.9)	562 (47.1)	1192
Total	1347 (50.5)	1318 (49.5)	2665	1487 (55.8)	1178 (44.2)	2665
	Next to next Previous Generation			Next to next Previous Generation		
Urban	862 (58.5)	611 (41.5)	1473	845 (57.4)	628 (42.6)	1473
Rural	637 (53.4)	555 (46.6)	1192	626 (52.5)	566 (47.5)	1192
Total	1499 (56.2)	1166 (43.8)	2665	1471 (55.2)	1194 (44.8)	2665

4. Discussions

This research analysis revealed that consanguineous marriages are still exists in the study area. Research study by Bittles [13, 14], Krishnamurthy & Audinarayana [15], and revealed Dravidian Hindus of South India strongly favour marriage between first cousins, particularly in the states of Andhra Pradesh, Karnataka and Tamil Nadu and parallel first cousin marriages occur in all caste groups of Hindus in Tamil Nadu [16]. Socio economic factors influence marriage pattern and it has been observed in this study also viz: women's education and place of living. Deleterious effects due to consanguineous marriages found to be more in the study area and women with consanguineous marriage had higher risk than non-consanguineous women and it has been observed by other scholars also [17, 18, 19], still parents perceived to celebrate their children's marriage with near relatives with a reasons: to avoid dowry and for economic reasons, job security (family profession). Social welfare department should evolve a strategy to counsel all youth in understanding the impact of consanguineous marriages on outcome of pregnancy, genetic deformity. In colleges and schools necessary orientation lectures should be arranged on genetic deformities, birth defects due to near relative marriages. Necessary youth awareness programs on impact of consanguineous marriages should be organized in all communities.

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