Research Article

A population-based cross-sectional study on consanguineous marriages in rural Tamil Nadu, India

Mohamed Saleem[1], Kanagasabapathy Shankar[2], Kalifulla Sabeetha[3]

[1]Institute of Community Medicine, Madurai Medical College, Madurai, Tamil Nadu, India.
[2]Department of Community Medicine, Meenakshi Medical College and Research Institute, Kanchipuram, Tamil Nadu, India.
[3]Department of Information Technology, PSNA College of Engineering and Technology, Dindigul, Tamil Nadu, India.
Correspondence to: Mohamed Saleem, E-mail: saleemsrmc@yahoo.com

Received November 20, 2015. Accepted November 30, 2015

Abstract

Background: Consanguineous marriages were common particularly in the south India. Though there were studies on consanguineous marriages, only a few were population-based studies. In this context, it was important to have population-based studies on the prevalence of consanguineous marriages and the pregnancy outcomes of consanguineous marriages.

Objective: This study has been carried out to estimate the prevalence of consanguineous marriages and its types among women aged between 15 and 49 years and to assess the association between consanguineous marriage and pregnancy outcome.

Materials and Methods: The study design was cross-sectional consisting of 750 married women aged between 15 and 49 years selected from Melur Taluk of Madurai district in Tamil Nadu, India, by cluster sampling method. Data were collected using a questionnaire that included background details, marriage details, and pregnancy outcome details.

Result: Of the 750 women studied, 294 had consanguineous marriage and the overall prevalence rate of consanguineous marriage was 39.2%. The most common type of consanguineous marriage was first cousin marriage (61.6%) and 19.7% had married their maternal uncle. Statistically significant positive association was found between the consanguinity and congenital anomaly, prenatal and postnatal loss except in the case of childhood deaths (1–5 years).

Conclusion: This study found that the prevalence of consanguineous marriages is comparatively higher in south India. Pregnancy outcomes such as abortions, stillbirths, congenital anomaly, and neonatal and infant deaths were found to be more common in consanguineous marriages. Consanguinity should be discouraged by giving health education to the public about the adverse effects of interrelated marriages.

KEY WORDS: Consanguineous marriage, pregnancy outcome, abortions, stillbirths, congenital anomaly

Introduction

It has been a tradition to marry biological relatives in many parts of the world. More than one billion people of various religious and ethnic backgrounds live in countries where a large proportion of marriages are conducted between blood relatives.[1] Consanguinity has been defined as the marriage or union between people of the same blood, which has decreased heavily in most of the developed countries. However, marriages between biological relatives have remained common[2] in the developing world.

Consanguinity is common, especially in people originating from the Middle East, the northern parts of Africa, and large parts of Asia. Most consanguineous marriages are legal in the United Kingdom; the exceptions are relationships between the second-degree relatives (e.g., uncle–niece, half siblings), and incest (i.e., relationship between the first-degree relatives); legislation on consanguineous marriage varies widely in different states of the United States.[3]

Access this article online	
Website: http://www.ijmsph.com	Quick Response Code:
DOI: 10.5455/ijmsph.2016.20112015221	

Even today, in many communities in India, the first preference is to get married within the family. Intra-community and consanguineous marriages are still more common and it has been so for centuries. Much of India, particularly south India, practiced endogamy or marriages within the community for centuries. In many communities, preference has been given to uncle–niece marriages and between cousins (mother's brother's child, father's sister's child).

Consanguinity is color-blind, region-blind, and religion-blind. India's population consists of thousands of subpopulations alienated by topography, language, faith, and caste boundaries and dominated by endogamous marriages. The final result has been formulated from multiple genetic isolates with individual anomaly profiles but to date, the clinical outcome of this extremely complex differentiation has been largely neglected. In contrast, the topic of consanguinity continues to draw debate among social scientists, geneticists, and clinicians.[4]

Consanguineous marriages promote family stability having significant social and economic advantages.[2,5] However, various studies had exposed the risks of pre-reproductive mortality, stillbirth, and infant death to be higher in the offspring of consanguineous marriage than their counterparts from nonconsanguineous marriages.[6]

There were studies that showed that more spontaneous abortions, stillbirths, neonatal and infant deaths, childhood deaths, and more congenital disorders occurred because of consanguineous marriages than of nonconsanguineous marriages even though some studies showed contradictory results. Therefore, it was important to have more studies on this issue.

In the view of the above, a cross-sectional study of consanguineous marriages in a rural population was taken up. The objective of this study was to estimate the prevalence of consanguineous marriages and its types among women aged between 15 and 49 years and to assess the association between consanguineous marriage and pregnancy outcome.

Materials and Methods

This study was done as a population-based, cross-sectional study. Melur Taluk of Madurai district in Tamil Nadu was selected as the study area, which included 77 villages. The study population included all married women aged between 15 and 49 years who resided in the Melur Taluk. The study was carried out from April 2014 to September 2015.

Based on the prevalence of a previous population-based study, the minimum sample size for the study was calculated as 750. Cluster sampling method was used for selecting study subjects. Thirty clusters were selected by probability proportionate to size (PPS) method and 25 married women aged between 15 and 49 years were selected from each cluster to obtain the total sample size of 750 married women aged between 15 and 49 years.

The cumulative population lists of 77 clusters were prepared for selecting 30 clusters by PPS method. The sampling interval was determined by dividing the total cumulative population (243,046) by the total number of clusters (30). The sampling interval was obtained as 8,102.

A random number equal to or less than the value of the sampling interval was chosen by using a random number table and it was 3,279. The cumulative population of the cluster area that just included 3,279 was selected as the first cluster. The sampling interval of 8,102 was added to the selected random number 3,279 and the total obtained was matched with the cumulative population list. The cluster that just included the study population of 11,381 was selected as the second cluster. By adding the sampling interval of 8,102 to the value 11,381, the third cluster was selected and by adopting the same method, subsequent clusters were selected.

After reviewing the literature on consanguineous marriages, a questionnaire was prepared in English. The final questionnaire consisted of three parts namely background details, marriage details, and pregnancy outcome details. Maximum care was taken to prepare the questionnaire to avoid wrong interpretation by the respondents. Data were collected using the final schedule through personal visit to the families of individuals selected by cluster sampling after getting the informed consent orally.

The data entry and analysis were done using SPSS software version 17. The final data were summarized into percentages and analyzed by cross tabulations for different variables. A 95% confidence interval (CI) was calculated wherever appropriate and χ^2-test was used for finding the statistical significance. Associations were assessed through odds ratio (OR) and its CI at 95%.

Result

As the study was on consanguineous marriages, the background characteristics of the women selected for the study at the time of marriage were more relevant than their current status.

The mean age of the women at the time of study was 31.2 years (standard deviation [SD] = 7) ranging from 19 to 48 years and the median age was 30 years. The current mean age of their husbands was 36.0 years (SD = 8.8) ranging from 24 to 56 years and the median age was 35 years.

The mean age of the women at the time of marriage was 19.4 years (SD = 3.14) ranging from 15 to 31 years and the median age was 19 years. Most of them (52.1%) got married when they were less than 19 years of age and 44% of them got married when they were between the age of 20 and 29 years. The mean age of their husbands at the time of marriage was 25.1 years (SD = 3.8) ranging from 20 to 44 years and the median age was 25 years. Table 1 shows the background characteristics of the study population.

A large proportion of the women (79.2%) belonged to joint families. A total of 44.1% of the women were married for lesser than 10 years, 42.2% were married for 10–20 years, and only 13.7% were married for more than 20 years.

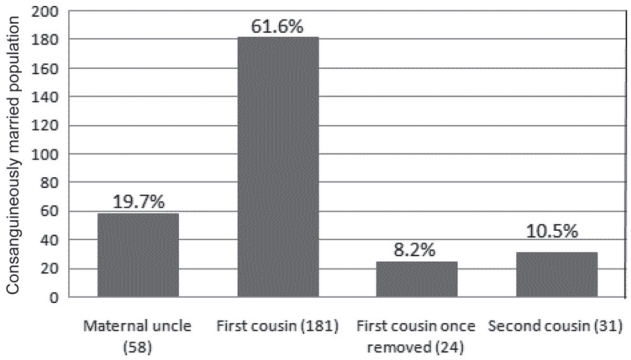

Figure 1: Types of consanguineous marriages in the study population.

Of the 750 women studied, 294 had consanguineous marriage and the overall prevalence rate of consanguineous marriage was 39.2% (95% CI: 35.7–42.7). The most common type of consanguineous marriage was the first cousin marriage (61.6%) and 19.7% of them had married their maternal uncle. About 8.2% of the women had married their first cousin once removed and 10.5% had married their second cousin. Among the first cousin marriages, 35.8% had married their paternal aunt's son and 25.8% had married their maternal uncle's son. Figure 1 shows the types of consanguineous marriages among the study population.

The mean number of conceptions among consanguineously married women was 2.8 and that among nonconsanguineously married women was 2.5. Consanguineously married women had higher proportion of more than two conceptions (58.3%) compared with nonconsanguineously married women (45.6%). The percentage of 1–2 conceptions and nil conceptions (sterility) were higher among the nonconsanguineously married women compared with the consanguineously married women and the differences were statistically significant. Table 2 shows the consanguinity and pregnancy outcome in the study population.

The mean number of live births among consanguineously married women was 2.3 and that among nonconsanguineously married women was 2.1. Consanguineously married women had higher proportion of more than two live births (35.4%) and 1–2 live births (61.7%) compared with nonconsanguineously married women. Nil live births were found in higher proportion among nonconsanguineously married women compared with consanguineously married women. However, the differences were not statistically significant.

In the abortions category, only the spontaneous abortions were taken into account for this analysis. In the consanguineous marriage group, 26.5% (78) of the women had either one or more spontaneous abortions. In nonconsanguineous marriage group, only 14.0% (64) of the women had either one or more spontaneous abortions. The difference was statistically significant ($p < 0.05$). The spontaneous abortions were found to be 2.2 times higher in consanguineous marriages than in nonconsanguineous marriages and that the higher risk of spontaneous abortions was found to be statistically significant.

In consanguineous marriage group, 9.9% (29) of women had one or more stillbirths. In nonconsanguineous marriage group, only 2.9% (13) of women had one or more stillbirths. The stillbirths were 3.7 times more in the consanguineous marriage group than in the nonconsanguineous marriage group. The higher risk of stillbirth in consanguineous marriage was found to be statistically significant.

Table 1: Background characteristics of the study population

Variable	Mean ± SD	Median	Minimum	Maximum
Age of women (years)	31.2 ± 7	30	19	48
Age of husband (years)	36.0 ± 8.8	35	24	56
Age of women at marriage (years)	19.4 ± 3.14	19	15	31
Age of husband at marriage (years)	25.1 ± 3.8	25	20	44
Total conceptions	2.59 ± 1.2	3	0	7
Total live births	2.19 ± 1.1	2	0	7

SD, standard deviation.

Table 2: Consanguinity and pregnancy outcome of the study population

	Abortions		Stillbirths		Neonatal death		Infant death		Childhood death		Congenital anomaly	
Consanguinity	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No
Yes	78	216	29	265	41	253	73	221	15	279	23	271
No	64	391	13	443	34	422	54	402	34	432	11	445
Odds ratio	2.2		3.7		2.0		2.5		0.7		3.4	
95% CI	1.5–3.1		1.9–7.3		1.2–3.3		1.7–3.6		0.4–1.3		1.6–7.2	
p-Value	0.001		0.001		0.005		0.001		0.250		0.001	

CI, confidence interval.

In consanguineous marriage group, 24.8% (73) of the women had one or more infant deaths. Of this, 56.2% (41) of deaths had occurred in the first 28 days of birth. In nonconsanguineous marriage group, 11.8% (54) of the women had one or more infant deaths. Of this, 63% (34) of deaths had occurred in the first 28 days of birth. The infant death (0 to 1 year) was 2.5 times more in consanguineous marriages than in nonconsanguineous marriages. This positive association between infant death and consanguineous marriage was found to be statistically significant. The neonatal deaths were two times more in consanguineous marriages than in nonconsanguineous marriages. The higher risk of neonatal death in consanguineous marriage was found to be statistically significant.

In consanguineous marriage group, 29.9% (88) of the women had fatal loss of one or more children. In nonconsanguineous marriage group, 19.3% (88) of the women had fatal loss of one or more children. The difference was statistically significant ($p < 0.05$). The childhood death was less common in consanguineous marriage group (OR = 0.68) than in nonconsanguineous marriage group. However, the association between childhood death and consanguineous marriage was not statistically significant.

A total of 7.8% of the children born of consanguineous marriages had congenital abnormality whereas only 1.5% of their nonconsanguineous counterparts had congenital abnormality. The congenital anomalies were found to be 3.4 times more in babies born of consanguineous marriages as compared with those born of nonconsanguineous marriages. The higher risk of congenital anomalies was found to be statistically significant.

Discussion

This study showed that the prevalence of consanguineous marriage was 39.2% among married women aged between 15 and 49 years. In Tamil Nadu, as per National Family Health Survey, India[7] and Kuntla et al.,[8] the estimated prevalence of consanguineous marriage was 38.2% and 38%, respectively. There were few other studies on the prevalence of consanguineous marriages in India and other countries.

A study by Badaruddoza et al.[9] in Aligarh of Uttar Pradesh had delineated the prevalence of consanguineous marriage to be 37.98%. The study by Nath et al.[10] in Shindoli village of Belgaum had outlined the prevalence of consanguineous marriage to be 36%. Another study by Verma et al.[11] in Pondicherry had reported the prevalence of consanguineous marriage as 30% whereas the study by Metgud et al.[12] in Belgaum had stated the prevalence of consanguineous marriage to be 20.3%. The lower frequency was due to the fact that that was a hospital-based study.

A study done at Yemen by Jurdi and Saxena[13] had recorded the prevalence of consanguineous marriage as 39.9%. Another study done by Saadat and Mohabbatkar had reported the prevalence rate of consanguineous marriages in Iran[14] to be 58.2%, which was high when compared with many other countries. The highest overall prevalence of consanguineous marriages in south and southeast Asia was recorded in Pakistan (62.7%), and it represented one of the highest national levels of consanguinity reported yet.[15]

The most frequent type of consanguineous marriages in this study was between first cousins (61.6%) and uncle–niece (19.7%). By comparison, uncle–niece marriage and first cousin unions had a long tradition in south India.[16] As a result, higher rates of consanguineous marriages were reported in the states south of the river Narmada namely Andhra Pradesh, Karnataka, and Tamil Nadu. The frequency of first cousin marriages varied from 5% to 57% in different parts of south India depending on the place of study.[8,17]

The study results had shown that the prenatal loss was elevated in consanguineous marriages. The spontaneous abortions were 2.2 times higher in consanguineous marriages than in nonconsanguineous marriages and the superior risk of spontaneous abortions was found to be highly statistically significant. Studies by Verma et al.,[11] Nath et al.,[10] and Kuntla et al.[8] showed that the abortions were higher in consanguineous groups than in nonconsanguineous groups. The study by Joseph and Mathew[18] had showed that abortions were significantly high in the Mudugar and the Irular tribes. Studied by Bittles and Black,[1] Hamamy et al.,[19] and Tadmouri et al.[20] did not observe any significant influence on fetal loss.

This study had shown that stillbirths were 3.7 times more in consanguineous marriages than in nonconsanguineous marriages and were found to be statistically significant. Several studies had shown that stillbirths were higher in consanguineous marriages than in nonconsanguineous marriages.[8,11,12,20] However, the study by Joseph and Mathew[18] had not shown any statistically significant difference in stillbirths among consanguineous groups and nonconsanguineous groups.

This study had shown that the neonatal deaths were two times more in consanguineous marriage group than in nonconsanguineous marriage group and were found to be statistically significant. The study by Stevenson et al.[21] had documented a higher frequency of neonatal deaths among the offspring of consanguineous marriages.

The study by Verma et al.[11] had showed that neonatal and infant mortality was higher in consanguineous mating. Studies by Nath et al.[10] and Rao and Inbaraj[22,23] had not observed any significant influence on neonatal deaths.

This study had shown that the infant deaths (0 to 1 year) were 2.5 times more in consanguineous marriage groups than in nonconsanguineous marriage groups. The positive association between infant deaths and consanguineous marriages was found to be statistically significant. Several studies had showed that infant mortality was higher in consanguineous mating and the difference was statistically significant.[11,20,23]

In this study, congenital anomalies were found to be 3.4 times more in babies born of consanguineous marriages than in those born of nonconsanguineous marriages. The higher risk of congenital anomalies was found to be statistically

significant. Many studies had shown increased incidence of congenital malformations in consanguineously married groups than in nonconsanguineously married groups.[9,11,24]

Conclusion

This study found that the prevalence of consanguineous marriages is comparatively higher in south India. Pregnancy outcomes such as abortions, stillbirths, congenital anomaly, and neonatal and infant deaths were found to be more common in consanguineous marriages than in nonconsanguineous marriages. Consanguinity should be discouraged by giving health education to the public about the adverse effects of interrelated marriages. In this regard, public health specialists, social scientists, geneticists, family physicians, obstetricians, and pediatricians need to be aware of the negative effects of consanguinity on pregnancy outcomes so that the vision of best possible genetic and antenatal care becomes a reality irrespective of the socioeconomic status of the people in need.

References

1. Bittles AH, Black ML. Evolution in health and medicine Sackler colloquium: consanguinity, human evolution, and complex diseases. Proc Natl Acad Sci USA 2010;107(suppl 1):1779–86.
2. Bittles AH. The role and significance of consanguinity as a demographic variable. Popul Dev Rev 1994;20(3):561–84.
3. *Consortium on Consanguinity*. Available at: http://www.consang.net (last accessed on July 5th, 2015).
4. Bittles AH. Endogamy, consanguinity and community genetics. J Genet 2002;81(3):91–8.
5. Hussain R. Community perceptions of reasons for preference for consanguineous marriages in Pakistan. J Biosoc Sci 1999; 31(4):449–61.
6. Tuncbilek E. Clinical outcomes of consanguineous marriages in Turkey. Turk J Pediatr 2001;43(4):277–9.
7. Indian Institute of Population Studies. *National Family and Health Survey, India, 1992–93*. Bombay, India: International Institute for Population Sciences, 1995.
8. Kuntla S Jr, Goli S Jr, Sekher TV, Doshi RP. Consanguineous marriages and their effects on pregnancy outcomes in India. Int J Sociol Soc Policy 2013;33(7/8):437–52.
9. Badaruddoza, Afzal M, Ali M. Inbreeding effects on the incidence of congenital disorders and fetal growth and development at birth in north India. Indian Pediatr 1998;35(11):1110–3.
10. Nath A, Patil C, Naik VA. Prevalence of consanguineous marriages in a rural community and its effect on pregnancy outcome. Indian J Community Med 2004;29(1):41–3.
11. Verma IC, Prema A, Puri RK. Health effects of consanguinity in Pondicherry. Indian Pediatr 1992;29(6):685–91.
12. Metgud CS, Naik VA, Mallapur MD. Consanguinity and pregnancy outcome among rural pregnant women of Belgaum District. Natl J Community Med 2012;3(4):681–4.
13. Jurdi R, Saxena PC. The prevalence and correlates of consanguineous marriages in Yemen: similarities and contrasts with other Arab countries. J Biosoc Sci 2003;35(1):1–13.
14. Saadat M, Mohabbatkar H. Inbreeding and its relevance to early and pre-reproductive mortality rates in Iran, an ecological study. Iranian J Pub Health 2003;32(2):9–11.
15. Ahmed T, Ali SM, Aliaga A, Arnold F, Ayub M, Bhatti MH, et al. *Pakistan Demographic and Health Survey 1990/91*. Islamabad, Pakistan: National Institute of Population Studies, 1992. pp. 9–13.
16. Sastri KAN. *A History of South India: From Prehistoric Times to the Fall of Vijayanagar*, 4th edn. Madras, India: Oxford University Press, 1976. p. 66.
17. Roychoudhury AK. Incidence of inbreeding in different states of India. Demogr India 1976;5(1–2):108–19.
18. Joseph S, Mathew PM. Effects of inbreeding in the Mudugar and Irular tribal populations in Kerala. J Hum Ecol 2005;17(4): 247–50.
19. Hamamy H, Antonarakis SE, Cavalli-Sforza LL, Temtamy S, Romeo G, Kate LP, et al. Consanguineous marriages, pearls and perils: Geneva International Consanguinity Workshop Report. Genet Med 2011;13(9):841–7.
20. Tadmouri GO, Nair P, Obeid T, Al Ali MT, Al Khaja N, Hamamy HA. Consanguinity and reproductive health among Arabs. Reprod Health 2009;6:17.
21. Stevenson AC, Johnston HA, Stewart MI, Golding DR. Congenital malformations. A report of a study of series of consecutive births in 24 centres. Bull WHO 1966;34(Suppl):9–127.
22. Rao PS, Inbaraj SG. Trends in human reproductive wastage in relation to long-term practice of inbreeding. Ann Hum Genet 1979;42(3):401–13.
23. Rao PS, Inbaraj SG. Inbreeding effects on human reproduction in Tamil Nadu of South India. Ann Hum Genet 1977;41(1): 87–98.
24. Becker R, Keller T, Wegner RD, Neitzel H, Stumm M, Knoll U, et al. Consanguinity and pregnancy outcomes in a multi-ethnic, metropolitan European population. Prenat Diagn 2015;35(1):81–89.

How to cite this article: Saleem M, Shankar K, Sabeetha K. A population-based cross-sectional study on consanguineous marriages in rural Tamil Nadu, India. Int J Med Sci Public Health 2016;5:730-734

Source of Support: Nil, **Conflict of Interest:** None declared.