CHAPTER 3

MATERIAL AND METHODS
The present study was conducted among the Pooja Gollas, a subcaste of Gollas inhabiting rural and urban areas in Bapatla taluk, Guntur district of Andhra Pradesh.

3.1 CHOICE OF POPULATION AND AREA

The primary reason for selecting the above population is due to lack of any systematic anthropological investigation on it. The only study of Sanghvi (1966) on smoking and chewing habits in relation to oral cancer among rural areas of Andhra Pradesh, which revealed high level of inbreeding among the shepherds (Gollas), is not anthropologically oriented. However, this paved the way for later investigations on inbreeding among the shepherds. In the same study Sanghvi noticed high levels of inbreeding in Coastal Andhra Pradesh. Our field area, in Bapatla taluk of Guntur district, which lies within the coastal belt of Andhra Pradesh was thus selected. Secondly, of all the taluks of the Guntur district, Bapatla was chosen for the present study as the Pooja Golla population is found to be chiefly concentrated here. Thirdly, the subcaste of Pooja Gollas is a stable, settled and identifiable population via the caste system. Lastly, the population appears to be the true representative of South Indian traditional system of social organisation. It is these factors that
prompted the researcher to select the Gollas for the present study.

3.2 DISTRIBUTION

The Pooja Golla population of our study are found in both rural and urban areas of Bapatla taluk. The Municipal town of Bapatla represents an urban area. The non-municipal parts of the taluk represented by hamlets/villages come under the category of rural area. The rural area of the taluk covers 50 villages with 21 of them inhabited by Pooja Gollas. The Pooja Gollas of the urban area are distributed in four different localities of the town. On the whole, the Pooja Golla population is much less concentrated in urban than in rural area.

3.3 SAMPLE

A total of 1975 couples constituted the study sample of which 1667 couples were drawn from rural area and the rest 308 couples from urban area. The village-wise distribution of couples in rural and in different localities of the urban area is presented as under (Table 1).
Table 1: Distribution of sample in rural and urban areas

<table>
<thead>
<tr>
<th>Village/locality</th>
<th>No. of marriages</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Rural area</strong></td>
<td></td>
</tr>
<tr>
<td>1. Alluru</td>
<td>49</td>
</tr>
<tr>
<td>2. Duddam</td>
<td>94</td>
</tr>
<tr>
<td>3. Cheruvu Jammulapalem</td>
<td>63</td>
</tr>
<tr>
<td>4. Chintayapalem</td>
<td>60</td>
</tr>
<tr>
<td>5. G.N.Palem</td>
<td>156</td>
</tr>
<tr>
<td>6. Gudipudi</td>
<td>42</td>
</tr>
<tr>
<td>7. Kankatapalem</td>
<td>92</td>
</tr>
<tr>
<td>8. Karlapalem</td>
<td>60</td>
</tr>
<tr>
<td>9. Manthenavaripalem</td>
<td>54</td>
</tr>
<tr>
<td>10. Maruproluvaripalem</td>
<td>66</td>
</tr>
<tr>
<td>11. Muthayapalem</td>
<td>38</td>
</tr>
<tr>
<td>12. Nallamothuvaripalem</td>
<td>55</td>
</tr>
<tr>
<td>13. Parlipadu</td>
<td>98</td>
</tr>
<tr>
<td>14. Pedagollapalem</td>
<td>271</td>
</tr>
<tr>
<td>15. Perali</td>
<td>99</td>
</tr>
<tr>
<td>16. Pinniboinavaripalem</td>
<td>185</td>
</tr>
<tr>
<td>17. Poondla</td>
<td>17</td>
</tr>
<tr>
<td>18. Pittalavaripalem</td>
<td>9</td>
</tr>
<tr>
<td>19. Vedullapalli</td>
<td>66</td>
</tr>
<tr>
<td>20. Yazali</td>
<td>82</td>
</tr>
<tr>
<td>21. Zillellamudi</td>
<td>11</td>
</tr>
<tr>
<td><strong>Total of rural area</strong></td>
<td><strong>1,667</strong></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Urban area</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Ramakrishnapuram</td>
<td>105</td>
</tr>
<tr>
<td>2. Padamatisatram</td>
<td>52</td>
</tr>
<tr>
<td>3. ChillaRagollapalem</td>
<td>106</td>
</tr>
<tr>
<td>4. Yanadi colony</td>
<td>45</td>
</tr>
<tr>
<td><strong>Total of urban area</strong></td>
<td><strong>308</strong></td>
</tr>
</tbody>
</table>

* Figure 1 shows location of 21 villages as per the serial number in the table
3.2 DATA COLLECTION

The field work was conducted by the author during 1979 to 1982 preceded by a pilot study which helped to plan and determine the method of data collection. During data collection, two types of schedules were used: household record schedule and personal record of married women. The specimen copies of these two schedules are appended (Appendices I and II).

The household record schedule was used to collect information on demographic and socio-economic aspects of the household members. This schedule contains the different columns like town/village, household number, income, names of the household members, their sex, relation to the head of the household, date of birth, marital status, education and occupation etc.

The schedule on personal record of married women was used to collect the past reproductive history of married women and other related aspects. This schedule contains the information such as names of husband and wife, their year of marriage, marital distance and type of consanguinous marriage. It also contains information on date of birth of woman, her age at puberty, marriage and consummation of marriage and her past reproductive history besides particulars on family planning.
3.3 METHODS OF DATA COLLECTION

3.3.1 Age estimation

Most of the Pooja Gollas are illiterates. Usually they do not keep records of their age. As a result, it became difficult to estimate their exact ages. The nearest possible age estimates were recorded with the help of the older members of the respective families, and those of the Pooja Golla society. Nevertheless a few of them maintained horoscopes which helped in recording the age. Sometimes physical appearance of the persons was considered in estimating the age. Important events including natural calamities occurred in their villages were also taken as basis for estimating the age.

3.3.2 Ascertaining consanguinity

Consanguinity was ascertained with the help of pedigrees. In addition, the local terms for different kinds of relationships were found useful to the extent of ascertaining whether a particular couple was consanguineous or not. But at the same time this method was not convenient always for the purpose. For example, the people generally call their cousin sister (1st cousin) or even a distant one as sister. During the course of our investigation, many such instances were encountered: father's brother's
daughter's daughter (1½ cousin), for example, is generally referred to as sister's daughter (uncle-niece); father's cousin sister's daughter (2nd cousin) was often referred to as father's sister's daughter (1st cousin). In such cases construction of pedigrees was found to be helpful.

3.3.3 Marital distance

It is the distance between the birth places of the spouses. It was estimated in km through travel routes. The distance for those married in the same village was scored as zero. The reported distances were sometimes estimated from the exact amount of fare fixed for the destination and the mode of transport used etc.

3.3.4 Congenital malformations

The externally visible congenital malformations were recorded following the methods suggested by Weiner and Lourie (1969).

3.4 TERMINOLOGY

The following terms have been used in the study according to the definitions given for each.

3.4.1 Primary sterility

Any married woman who has not produced a liveborn
after consummation of marriage and unprotected sexual activity.

3.4.2 Duration of marriage (effective married life)

This is calculated by taking into consideration the actual period from the year of marriage/consummation/sterilization/widowhood/separation/year of investigation depending on the case which ever is the appropriate. This definition is used in studying primary sterility and fertility (pregnancies and livebirths).

3.4.3 Pre-natal deaths

It includes all foetal deaths before birth. They are classified into abortions and still-births. Abortions mean foetal loss upto and including 6th month of gestation. Still-births mean foetal deaths from the start of 7th month to after upto birth.

3.4.4 Post-natal deaths

Deaths after birth are known as post-natal deaths. They are classified into neonatal deaths (deaths under 28 days), post-neonatal deaths (deaths from 28 days to 365 days), infant deaths (neonatal and post-neonatal deaths i.e., 0 to 1 year) and child deaths (1 to 14 years and 0-14 years). Total deaths include both pre-natal, post-natal deaths.
3.5 **Mortality Rates**

The following formulae were used in estimating the mortality rates:

Total foetal loss rate = \( \frac{\text{Total foetal loss reported}}{\text{Total pregnancies reported}} \) \times 100

Total abortion rate = \( \frac{\text{Total abortions reported}}{\text{Total pregnancies reported}} \) \times 100

Total stillbirth rate = \( \frac{\text{Total stillbirths reported}}{\text{Total pregnancies reported}} \) \times 100

Neonatal mortality rate = \( \frac{\text{No. of deaths under 28 days}}{\text{No. of livebirths observed}} \) \times 1

Post-neonatal mortality rate = \( \frac{\text{Deaths of infants of age 28 days to under one yr.}}{\text{Livebirths \(-\) Neonatal deaths}} \) \times 100

Infant mortality rate = \( \frac{\text{No. of deaths under one year of age}}{\text{No. of livebirths}} \) \times 100

Post-natal mortality rate (1 to 14 yrs) = \( \frac{\text{No. of post-natal deaths (1 to 14 years)}}{\text{No. of livebirths \(-\) Infant deaths}} \) \times 100
Post-natal mortality rate \( (0 \text{ to } 14 \text{ yrs}) \) = \( \frac{\text{No. of post-natal deaths}}{\text{No. of livebirths observed}} \times 100 \)

Total mortality rate = \( \frac{\text{No. of pre- and postnatal deaths (0 to 14 years)}}{\text{No. of pregnancies observed}} \times 100 \)

3.6 DATA PROCESSING

The data was analysed with the help of computer. In this connection, a standard coding key was prepared in consultation with Prof. P. S. S. Sundar Rao, Head, Department of Biostatistics, Christian Medical College, Vellore, to code the data in order to transfer it from the research schedules to 80 column data coding sheets. This information from the data coding sheets was transcribed on to 80 column punching cards. Data from the punching cards were transferred to 9 track magnetic tapes and analysis was done on IBM 360/370 Computer Systems. Standard package programmes such as the SPSS were used for preparation of the basic tabulations and analyses.

3.7 STATISTICAL CONSIDERATIONS

The following statistical methods were used in the analysis of the data:
3.7.1 **Arithmetic Mean**

It is the most commonly used estimation of average. It was calculated by adding and dividing the sum by the total number of values.

\[ \bar{X} = \frac{\sum X}{N} \]

where, \( \bar{X} \) : mean value;
\( \sum X \) : sum of all values;
\( N \) : number of values.

3.7.2 **Standard Deviation** (\( \sigma \))

It is the most important measure of dispersion. It was calculated by finding the square root of the mean of the deviation from mean squared. The following formula was used in computing the standard deviation

\[ \sigma = \sqrt{\frac{\sum f x^2}{N} - \left( \frac{\sum f x}{N} \right)^2} \]

3.7.3 **Standard Error** (S.E)

It indicates the magnitude of sampling error. The size of the sampling error varies with the sample size and
its variation as well as the statistics involved. It was calculated as follows:

\[ S.E. = \frac{\sigma}{\sqrt{N}} \]

3.7.4 Chi-square test \((\chi^2)\)

To test the significance of the difference between the observed \((o)\) and expected \((e)\) frequencies, the following formula was applied:

\[ \chi^2 = \sum \frac{(o-e)^2}{e} \]

3.7.5 Proportion test (Test for measuring the difference between two proportions - Z-test)

<table>
<thead>
<tr>
<th>Sample 1</th>
<th>Sample 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Consanguineous marriages</td>
<td>Non-consanguineous marriages</td>
</tr>
<tr>
<td>(n_1) = total number of pregnancies</td>
<td>(n_2) = total number of pregnancies</td>
</tr>
<tr>
<td>(p_1) = proportion of abortions and stillbirths to pregnancies and various post-natal deaths to livebirths =</td>
<td>(p_2) = proportion of abortions and stillbirths to pregnancies and various post-natal deaths to livebirths =</td>
</tr>
<tr>
<td>(\frac{p_1 \times 100}{n_1})</td>
<td>(\frac{p_2 \times 100}{n_2})</td>
</tr>
</tbody>
</table>
Standard error of difference found between proportions.

\[ p = \frac{n_1 p_1 + n_2 p_2}{n_1 + n_2} \]

assuming the null hypothesis is true.

The standard error of the difference between the proportions \( p \):

\[ s(p_1 - p_2) = \sqrt{\frac{pq}{n_1} + \frac{pq}{n_2}} \]

where, \( q = 1 - p \) (\( q = 100 - p \) if \( p \) is given in percentages).

Critical Ratio = \[
\frac{\text{Difference in proportions}}{\text{Standard error of the difference in proportions}}
\]

\[ = \frac{p_1 - p_2}{\sqrt{pq/n_1 + pq/n_2}} \]

8.7.6. Test for the significance of difference between means in large samples

The \( t \)-values were computed to know the significant difference, if any, between the mean values of quantitative variables using the following formula:

\[ t = \frac{\bar{x}_1 - \bar{x}_2}{\sqrt{S.E_1^2 + S.E_2^2}} \]

where, \( \bar{x}_1 \) : mean of the variable of consanguineous sample;
\( \bar{x}_2 \): mean of the variable of non-consanguineous sample;

S.E.\(_1\): standard error of \( \bar{x}_1 \);

S.E.\(_2\): standard error of \( \bar{x}_2 \);

\( n_1 \): size of the first sample;

\( n_2 \): size of the second sample.

3.7.7 **Inbreeding coefficient (\( \alpha \))**

The average autosomal and sexlinked inbreeding coefficients were calculated according to the following formula:

\[
\alpha = \frac{\sum F_{c} \cdot n}{N}
\]

where, \( n \): frequency of a certain category of a consanguineous marriage, e.g., uncle-niece, first cousin etc.

\( F_{c} \): coefficient of inbreeding (autosomal/sex-linked) for a particular category of consanguineous marriage;

\( \sum \): the sum for different categories of consanguineous marriages observed;

\( N \): total number of marriages enquired into concerning a certain group.
3.7.8 Regression analysis

Inbreeding effect on certain aspects of human reproduction was examined through an exponential model

\[ P_1 = 1 - \exp \left[ -\left( \alpha + \beta P_1 \right) \right] \]

where, \( P_1 \) is the estimated proportion of subjects with sterility, stillbirths, infant mortality and congenital malformations in the sub-group based on type of parental consanguinity, and \( P_1 \) is the Wright's coefficient of inbreeding for the respective subgroup. The estimates of \( \alpha \) and \( \beta \) (A and B) were obtained through weighted least-squares technique (Smith, 1967) and goodness of fit tested using appropriate distribution. The Fortran programme of MacCluer et al. (1967) modified by Sundar Rao (1985) has been used to fit the exponential curve and to carry out the tests of significance.