4.1 Introduction:

Child which survives longer, grows into a full man and becomes a citizen and make his/her country progress further. Unfortunately, in India, it has been observed that there are number of foetal wastages and early neonatal deaths. There are various factors to this natural calamity, in the problem of human survival.

Postal wastage means, the total number of still births and abortions. If it can be decreased, the mothers have a good health.

The causes of still birth are as follows:

(1) The non-availability of medical treatment during the pregnancy period.
(2) The lack of nutritious food.

(3) To save the pregnant mother's life.

(4) Pregnant mother's ignorance about the changes in the condition of her health.

Two types of abortions take place in society.

(1) Abortions resulting from illegitimate relations.

(2) Abortions with approval of law, society or religion.

(1) Abortions resulting from illegitimate relations:

Some times illegitimate sexual relations take place in society. Supposing a lonely woman is raped or seduced in a lonely place by an unknown man. She has not entered the bond of wedlock with him. And because of the forced sexual act she becomes pregnant. She is required to get abortion. If she does not get abortion, she will be rejected by her family and society. Her whole family has to suffer because of this scandal. This abortion resulting out of illegitimate relation is resorted to not only by unmarried women but by married women and widows also.
Some times it also happens that a woman unwillingly sells her body just to earn her livelihood. Sometimes women with unfulfilled desires like to sleep with other men. If such women are either ignorant about the contraceptives or careless in some cases, they become pregnant. Such women are forced to get abortions.

It is not possible to avoid abortions of this kind because the social evils are too strong and powerful. It is not possible for a researcher to get the details about the exact number of such abortions as the women in question do not get their names registered in hospital records. They keep the abortion a secret in order to escape public fury. So it is not possible to find out effective means to avoid such abortions.

(2) Abortions with approval of law, society or religion:

Women get their names registered in the hospital records without any fear because these abortions are legal. The occasions on which women get the legal abortions are as follows:
(1) When the child in the womb of mother is weak because of malnutrition, the doctor advises such mothers to get abortions.

(2) When a mother has a large number of children, the doctor advises her to take recourse to abortion.

(3) When a pregnant mother's life is in danger, the doctor asks her to get abortion.

(4) Some couples are not willing to take up the responsibility of bringing up children in their early married life. So in order to avoid this responsibility they resort to abortions.

It is not possible to stop abortions resulting from illegitimate relations. But we can decrease the number of abortions which are approved by the law, society or religion, by giving the nutritious food to pregnant mother, knowledge of family planning and medical treatment during her pregnancy period.

We have tried to study the extent of foetal wastage in Anand Town. An attempt has also been made to know
the factors which affect the still births and abortions, so that appropriate means can be thought of to decrease the rate of foetal wastage.

Some of the studies which are relevant to the problem, are made by Morris and Heady (1955), Heady, Daly and Morris (1955), Daly, Heady and Morris (1955), Marchal (1972), Freedman, Whelpton and Champbell (1969), Shapire, Jones and Densen (1962), Freedman, Combs and Friedman (1966), Petter, Wyon and Corden (1965), Jain (1969), Carlos et.al. (1969) and Gandotra (1975).

In the above studies, it has been noted that though the causes of still birth and abortion are multiple, the importance of each of those causes is not implicitly determined. In this chapter, an attempt has been made to examine the crude impact of the factors: Sex, Maternal Age and Gravida on still birth rate, on one hand, and the relative effect of each of these factors individually, in the absence of the influence of the other factors on the other hand. Similarly an attempt has been made to examine the crude impact of the factors: Maternal Age and Gravida on the risk of spontaneous abortion, on one hand, and the relative effect of each of these factors
individually, in the absence of the influence of other factors on other hand.

It is extremely difficult to collect complete and accurate information about pregnancy losses in any retrospective study. The problems of detecting early miscarriages, memory lapses, unwillingness to divulge information on abortions and still births, lack of knowledge in distinguishing a still birth from the death of a new born infants etc. are well known and make accurate assessment of pregnancy wastage difficult. To over-come such difficulties data are collected from the case-card records of mothers registered for delivery, during the period 1978-80 in Anand Municipal Hospital, ANAND. During that period 3431 pregnancies are recorded with complete information as per performa. And out of these 196 are found to have ended into abortions and 185 to still births.

4.2. Methodology:

To study the influence of each of the factors under investigation on still birth rate and abortion, a binary variable multiple regression method described by Feldstein (1966) and later used by Shah (1971) is adopted.
This method is helpful in simultaneous adjustment of large number of variables and uses directly the classificatory data. Another major advantage of this technique is that qualitative variables could also be analysed with it. However the use of some continuous variables like maternal age and infant birth weight, as discrete variables may weaken the analysis slightly.

In this study, still birth rate is assumed to have the impact of the following three factors: (1) Maternal Age (2) Gravida (3) Sex of the Infant. The risk of abortion is assumed to have the impact of the following two factors: (1) Maternal Age (2) Gravida. Each factor is divided into following subclasses:

(1) Maternal Age: Mothers included in this study are divided into $r_1 = 5$ subgroups with regards to their age: (1) less than 20 years (2) 20 - 24 years. (3) 25 - 29 years. (4) 30 - 34 years and (5) 35 years and above. Four binary variables $X_1, X_2, X_3, X_4$ are used to denote these subclasses. $(0, 0, 0, 0)$ means that mothers belong to the class (5) i.e., they are of age 35 years and above.
(2) **Gravida**: It determines the order of pregnancy. $r_2 = 4$ categories are made: (1) First order (2) Second order (3) 3-5 order and (4) 6 and higher order pregnancies. Three binary variables $x_5$, $x_6$, $x_7$ are used to denote these subclasses. (0, 0, 0) means that the order of present pregnancy of mother belongs to the class (4) i.e., the order of present pregnancy of mother is 6 and above.

(3) **Sex**: Still births are divided into $r_3 = 2$ categories according to their sex: (1) Male (2) Female. One binary variable $x_8$ is used to denote these subclasses. (0) means that the live birth is female.

For the purpose of multiple regression analysis, all the variables are considered as binary variables taking the value 0 or 1. And each subclass of the variable is considered here as separate regressor (Feldstein, 1966). We describe the binary regression technique for the study of still birth rate. For the study of abortion, the method is modified by deleting the variable $x_8$ (Sex). The regression equation of the still births on the independent variables mentioned above is given as follows:
(4.2.1) \[ y = \beta_0 x_0 + \beta_1 x_1 + \beta_2 x_2 + \beta_3 x_3 + \beta_4 x_4 + \beta_5 x_5 + \beta_6 x_6 + \beta_7 x_7 + \beta_8 x_8 + \epsilon_t \]

Using the standard procedure, the least square estimates of regression coefficients are obtained as described in the previous chapter. The percentage deviations from average risk of still birth and abortion are also obtained by the method described in the previous chapter.

4.3 Results and Discussions For Still Birth Rate:

In the overall population of Anand Municipal Hospital, Anand, the rate of foetal wastage is found to be 111 per 1000 pregnancies. Out of these 58 per 1000 pregnancies are classified as terminated into abortions and 53 per 1000 pregnancies into still births. The level of foetal wastage in eleven villages of Punjab is estimated to be 136 per 1000 pregnancies (Potter et. al. 1965). The level of foetal wastage in Baroda is estimated 162 per 1000 pregnancies (Gandotra, 1975).

Comparing the findings of the other studies, the foetal wastage estimate of 111 per 1000 for the present
study appears to be a lower estimate. However the still birth rate of 53 per 1000 is higher than, the rates reported in other studies. In contrast, the abortion rate of 58 per 1000 seems to be below the rate of spontaneous abortion. The cases are registered in the Hospital just at the time of delivery and thus do not avail the facilities of ante-natal care which the hospital provides. At the same time, there are less chances for these cases to report early miscarriages.

The unadjusted percentage deviations from the average risk of still birth is obtained for each variable (i.e., Maternal Age, Order of Gravida, Sex) in the absence of the effect of all other variables. The adjusted percentage deviations from the average risk of still birth is obtained in the presence of the effect of all variables.

The regression equation when the effect of all variables is to be considered is obtained as follows:

\[ y = 0.0900 - 0.0431X_1 + 0.0066X_2 - 0.0067X_3 - 0.0030X_4 - 0.0298X_5 - 0.0565X_6 - 0.0463X_7 + 0.0215X_8. \]
FACTORs RELATED TO STILL BIRTHS

4.3.1 Maternal Age:

The regression equation of still birth on maternal age is obtained as follows:

\[ y = 0.0744 - 0.0469 x_1 - 0.0073 x_2 - 0.0248 x_3 - 0.0153 x_4. \]

Table 4.1 indicates the percentage deviations from average risk of Still Birth by Maternal Age.

**TABLE 4.1**

PERCENTAGE DEVIATIONS FROM AVERAGE RISK OF STILL BIRTHS BY MATERNAL AGE:

<table>
<thead>
<tr>
<th>Age Group (In years)</th>
<th>Unadjusted</th>
<th>Adjusted</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>y_1</td>
<td>Deviations Standard Error</td>
</tr>
<tr>
<td>&lt; 20</td>
<td>5</td>
<td>-54.9075</td>
</tr>
<tr>
<td>25 - 29</td>
<td>47</td>
<td>-16.2624</td>
</tr>
<tr>
<td>30 - 34</td>
<td>26</td>
<td>0.3497</td>
</tr>
<tr>
<td>35 and above</td>
<td>16</td>
<td>27.1040</td>
</tr>
</tbody>
</table>

*y_1* = no. of still births in subclass 1.
It is clear from the unadjusted deviations shown in Table 4.1, that the risk of still birth is higher than average for those babies whose mothers are of age 20 years and above except the age group 25 - 29 years. After considering the effect of all other variables, it is clear from the adjusted deviations that the babies whose mothers are of age 30 years and above have greater risk of still birth than the babies of the younger mothers (less than 20 years).

As the unadjusted percentage deviations are less than two times the standard error, the risk of still birth from average for Maternal Age (< 20, 20 - 24, 25 - 29, 30 - 34, 35 and above) is found to be statistically insignificant. Similarly the adjusted percentage deviations are less than two times the standard error except in the case of maternal age < 20 years. So the risk of still birth from average for maternal age (20 - 24, 25 - 29, 30 - 34, 35 and above) is found to be statistically insignificant while it is found to be statistically significant in the case of Maternal Age less than 20 years. This shows that in the absence of other factors, age has no effect on still birth, but in the presence of other factors, the maternal age less than 20 years has effect on still birth.
4.3.2 Gravida:

The regression equation of still birth on gravida is found as follows:

\[(4.3.3) \quad y = 0.0990 - 0.0305 X_1 - 0.0537 X_2 - 0.0461 X_3.\]

Table 4.2 indicates the percentage deviations from average risk of Still Births by Gravida:

\begin{table}
\begin{tabular}{|c|c|c|c|c|}
\hline
Gravida & Unadjusted & & Adjusted & \\
 & $y_1$ & Deviations & Standard error & Deviations & Standard error \\
\hline
5 and above & 20 & 69.7711 & 27.8035 & 70.8203 & 31.9653 \\
\hline
\end{tabular}
\end{table}

* $y_1$ = No. of still births in subclass 1.

It is clear from the unadjusted deviations shown in Table 4.2, that babies of mothers of lowest gravida one
and highest gravida 6 and above have higher risk of still births than that of average. And the babies of mothers of intermediate gravida 2 to 5 have lower risk of still birth than that of the average. The trend of unadjusted deviations from average risk of still births by gravida seems to follow a U-shaped pattern. This trend is same even after the adjustment is made. This is obvious from Figure 3.

After considering the effect of all other variables, it is clear from the adjusted deviations that babies of mothers of lowest gravida one and higher gravida 6 and above have higher risk of still birth than that of average. The comparison of unadjusted and adjusted percentage deviations indicates that the influence of gravida on still births is increased to some extent.

The unadjusted percentage deviations are less than two times the standard error except in the case of Gravida 6 and above. So the risk of still birth from average for Gravida 1, 2, 3-5 is found to be statistically insignificant, while it is found to be statistically significant in the case of Gravida 6 and above. This shows that in the absence of other factors Gravida 6 and above has more impact on still birth. The adjusted
percentage deviations are less than two times the standard error in the case of Gravida 1 and 3 - 5. So the risk of still birth from average for Gravida 1 and 3 - 5 is found to be statistically insignificant. The adjusted percentage deviations are greater than two times the standard error in the case of Gravida 2 and 6 and above. So the risk of still birth from average for Gravida 2 and 6 and above is found to be statistically significant. This shows that in the presence of other factors Gravida 2 and 6 and above have more impact on still birth.

4.3.3 Sex:

The regression equation of still birth on sex is found as follows:

\[(4.3.4) \quad y = 0.0477 + 0.0206 x_1.\]

Table 4.3 indicates the percentage deviations from average risk of Still Births by Sex.
TABLE 4.3

PERCENTAGE DEVIATIONS FROM AVERAGE RISK OF STILL BIRTHS BY SEX

<table>
<thead>
<tr>
<th>Sex</th>
<th>Unadjusted</th>
<th>Adjusted</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>$y_i$</td>
<td>Deviations</td>
</tr>
<tr>
<td></td>
<td></td>
<td>error</td>
</tr>
<tr>
<td>Male</td>
<td>116</td>
<td>16.6121</td>
</tr>
<tr>
<td>Female</td>
<td>69</td>
<td>-19.4049</td>
</tr>
</tbody>
</table>

$y_i$ = No. of still births in subclass $i$.

It is clear from the unadjusted deviations shown in Table 4.3, that Male babies have higher risk of still births than that of average. After considering the effect of all other variables, it is clear from the adjusted deviations that Male babies have higher risk of still birth than that of average. The comparison of unadjusted and adjusted percentage deviations indicates that the influence of sex on still births is increased to some extent.

The unadjusted and adjusted percentage deviations are greater than two times the standard error. Hence the risk of still births from average, for males and
females is found to be statistically significant. This shows that sex plays an important role in explaining the risk of still births.

**FACTORS RELATED TO ABORTIONS**

4.3.4 Results and Discussions for Abortions:

The regression equation when the effect of all variables is to be considered is obtained as follows:

\[(4.3.5) \quad y = 0.0480 + 0.0185 X_1 + 0.0038 X_2 - 0.0183 X_3 \\
- 0.0235 X_4 + 0.0212 X_5 + 0.0176 X_6 \\
+ 0.0238 X_7 \]

4.3.4.1 Maternal Age:

The regression equation of Abortion on Maternal Age is obtained as follows:

\[(4.3.6) \quad y = 0.0613 + 0.0263 X_1 + 0.0112 X_2 - 0.0107 X_3 \\
- 0.0174 X_4 \]

Table 4.4 indicates the percentage deviations from average risk of Abortions by Maternal Age.
### TABLE 4.4

PERCENTAGE DEVIATIONS FROM AVERAGE RISK OF ABORTIONS BY MATERNAL AGE.

<table>
<thead>
<tr>
<th>Age Group (in years)</th>
<th>y&lt;sub&gt;1&lt;/sub&gt;</th>
<th>Unadjusted Deviations</th>
<th>Standard error</th>
<th>Adjusted Deviations</th>
<th>Standard error</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt; 20</td>
<td>17</td>
<td>42.5623</td>
<td>27.7069</td>
<td>40.2437</td>
<td>29.9923</td>
</tr>
<tr>
<td>20 - 24</td>
<td>99</td>
<td>17.5548</td>
<td>7.3631</td>
<td>15.8987</td>
<td>9.1252</td>
</tr>
<tr>
<td>30 - 34</td>
<td>19</td>
<td>-29.8102</td>
<td>17.5052</td>
<td>-29.3133</td>
<td>19.4759</td>
</tr>
<tr>
<td>35 and above</td>
<td>13</td>
<td>-0.9937</td>
<td>24.1131</td>
<td>9.6055</td>
<td>25.4546</td>
</tr>
</tbody>
</table>

*<sub>y<sub>1</sub> = No. of abortions in subclass i.</sub>

It is clear from the unadjusted deviations shown in Table 4.4, that the risk of abortion is higher than average for those babies whose mothers are of age < 24 years.

After considering the effect of all other variables, it is clear from the adjusted deviations that babies whose mothers are of age 24 years and below and 35 years and above have greater risk of abortion than average. It is also clear from the unadjusted and adjusted percentage deviations that abortion rate decreases with the increase in the age of mother up to age of 34 years and then increases.
Comparing the unadjusted percentage deviations with two times their standard errors, it is seen from Table 4.4 that the risk of abortion is statistically insignificant from the average for maternal ages in groups less than 20 years and greater than 29 years, while it is statistically significant for maternal ages in the interval 20 - 29 years. Comparing the adjusted percentage deviations, we find from Table 4.4 that the risk of abortion from the average is statistically insignificant except for maternal age group 25 - 29 in which it is statistically significant. This shows that in the absence of other variables, the maternal age groups 20 - 24 and 25 - 29 have significant effect on the risk of abortion. However, in the presence of other variables, only the maternal age group 25 - 29 has a significant effect on the risk of abortion.

4.3.4.2 Gravida:

The regression equation of Abortion on Gravida is obtained as follows:

\[(4.3.7) \quad y = 0.0372 + 0.0348 X_1 + 0.0226 X_2 + 0.0219 X_3.\]
Table 4.5 indicates the percentage deviations from average risk of Abortion by Gravida.

**TABLE 4.5**

PERCENTAGE DEVIATIONS FROM AVERAGE RISK OF ABORTIONS BY GRAVIDA:

<table>
<thead>
<tr>
<th>Gravida</th>
<th>Unadjusted</th>
<th>Adjusted</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Deviations</td>
<td>Standard error</td>
</tr>
<tr>
<td>1</td>
<td>72</td>
<td>16.5612</td>
</tr>
<tr>
<td>2</td>
<td>47</td>
<td>-3.6434</td>
</tr>
<tr>
<td>3 - 5</td>
<td>69</td>
<td>-4.6027</td>
</tr>
<tr>
<td>6 and above</td>
<td>8</td>
<td>-41.078</td>
</tr>
</tbody>
</table>

\[ y_i = \text{No. of abortions in subclass } i. \]

It is clear from the unadjusted deviations shown in Table 4.5, that babies of mothers of lowest gravida one have higher risk of abortion than that of the average. And the babies of mothers of gravida 2 and above have lower risk of abortion than that of the average. After considering the effect of all other variables, it is clear from the adjusted deviations that babies of mother of lowest gravida one and gravida 3 - 5 have higher risk.
of abortion than that of average; while the babies of mothers of gravida 2 and gravida 6 and above have lower risk of abortion than that of the average.

As the unadjusted percentage derivations, are less than two times the standard error, the risk of abortion from average for all gravidas is found to be statistically insignificant. Even after the adjustment is made, the pattern remains same. This shows that, in the absence or presence of other factors gravida has no effect on the risk of abortion.

4.4 Conclusions:

(1) The risk of still birth is higher than average for those babies whose mothers are of age 20 years and above except the age group 25 - 29 years. But after considering the effect of all other variables, the risk of still birth is higher than average for those babies whose mothers are of age 30 years and more.

(2) The babies of mothers of lowest gravida one and highest gravida 6 and above have higher risk of still birth than that of the average.
(3) Male babies have higher risk of still birth than female babies.

(4) The risk of abortion is higher than average for those babies whose mothers are of age less than 24 years. But after considering the effect of all other variables the risk of abortion is higher than average for those babies whose mothers are of age less than 24 years and 35 years and above.

(5) Gravida has no effect on the risk of abortion.
Figure S: PERCENTAGE DEVIATIONS FROM AVERAGE STILL BIRTHS BY GRavI DA

- - - - - - unadjusted deviations

- - - - - - adjusted deviations