CHAPTER 6

Conclusion and Summary

<table>
<thead>
<tr>
<th>Section</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>6.2</td>
<td>Child mortality rates and causes of child death</td>
</tr>
<tr>
<td>6.3</td>
<td>Socio-economic factors and child mortality</td>
</tr>
<tr>
<td>6.4</td>
<td>Environment and sanitation and child mortality</td>
</tr>
<tr>
<td>6.5</td>
<td>Exposure to mass media and child mortality</td>
</tr>
<tr>
<td>6.6</td>
<td>Biological/demographic factors and child mortality</td>
</tr>
<tr>
<td>6.7</td>
<td>Breastfeeding and child mortality</td>
</tr>
<tr>
<td>6.8</td>
<td>Medical/health care factors and child mortality</td>
</tr>
<tr>
<td>6.9</td>
<td>Desire number of children and child mortality</td>
</tr>
<tr>
<td>6.1</td>
<td>Estimation of survival function and construction of life table</td>
</tr>
<tr>
<td>6.11</td>
<td>Factor analysis for child mortality</td>
</tr>
<tr>
<td>6.12</td>
<td>Recommendations</td>
</tr>
</tbody>
</table>
CHAPTER 6

Conclusion and Summary

6.1 Introduction

The present study examines child mortality and their determinants for valley area of Manipur state, India, using primary data from sample survey conducted during 1st May, 2008 to 30th April, 2009. The study area that is valley area of Manipur is spread in four districts namely Bishnupur, Imphal East, Imphal West and Thoubal. The child mortality rates four these four districts of Manipur are estimated and effects of socio-economic background characteristics, environment and sanitation characteristics, exposure to mass media characteristics, biological/demographic characteristics, breastfeeding characteristics, medical/health care characteristics and parent’s desire number of children on child mortality are examined. The variables of interest under the above seven determinants are fifty five in number as prognostic variables along with survival status of child as dependent variable. In socio-economic determinant, ten individual prognostic variables are studied. They are religion, type of caste, place of residence, family structure, educational level of mother, educational level of father, electrification, number of family members, occupation of mother and standard of living index. The prognostic variables like source of drinking water, type of cooking fuel, availability of windows, house type and type of toilet facility are considered as environment and sanitation determinants of child mortality and their effects on child mortality are
examined in the study. For exposure to mass media determinants, there are six
prognostic variables and they are availability of radio, availability of television,
frequency of reading newspaper per week, listening radio per week, watching
television per week and visiting cinema hall or theatre per month. In case of
biological/demographic determinants of child mortality, eleven prognostic variables
are studied. They are present age of mother, number of ever born children, age of
mother at first birth, history of abortion/miscarriage, multiple births, sex of child,
pregnancy complications, parity, age at delivery, menstruation cycle and maternal
age at marriage. The effects of breastfeeding determinants on child survival status is
examined on the basis of three prognostic variables viz., breastfeeding, duration of
breastfeeding and plain water. The effects of medical/health care factors or
determinants viz., use contraceptive, prenatal check up, antenatal visit, baby
postnatal check up within 2 months, place of delivery, delivery by caesarean section,
iron tablets/syrup supplementation during pregnancy, antenatal care, tetanus
injections before birth, immunization of children like BCG, DPT three doses, Polio
three doses and measles are examined on child survival status. The last but not the
least, the factors of parent’s desire number of children viz., ideal number of boys
and ideal number of girls are considered as prognostic variables and examined the
effects of these variables on survival status of child.

In preliminary analysis of the study, univariate analysis of each individual
prognostic variable which influences on child mortality without controlling the
effects of other variables has been conducted by using chi-square test. In the next
step of the analysis, logistic regression model of both unadjusted and adjusted
methods are employed to identify the effect of individual variable on child mortality.
Further, step-wise logistic regression analysis is carried out to determine the most significant set of variables that influence on child mortality.

In third stage of analysis, Cox’s proportional hazard model is fitted by defining survival status of child as indicator variable, survival time of child as response variable and the seven prognostic variables which have been found significantly effect on child mortality in step-wise logistic regression analysis as covariates. Further, factor analysis is applied in the study subject to reduce the large number of prognostic variables which have been directly or indirectly effects on child mortality into a set of factors or components and measure the degree of influences of these factors on child mortality. Thus, this method reduces the large number of influencing prognostic variables into a compact and most significant as well as most meaning set of factors or derived variables. And it leads further to analysis more meaningful.

6.2 Child mortality rates and causes of child death

Overall child mortality rate of the study population is 47.85 per 1,000 under five children. Among districts, Imphal East district has the highest under5 mortality rate with 73.9 per 1000 under5 children and it is followed by Bishnupur district (42.4), Imphal West district (38.2) and the lowest is Thoubal district with 35.4 per 1000 under5 children.

The major cause of child deaths in the study area is due to diarrhea (15%) and followed by infectious diseases (12.5%), pneumonia (10%); and congenital, malaria and preterm each with 2.5 percent. Moreover, 35% of child deaths are due to
other diseases like nutritional diseases, meningitis/encephalitis, acute bacterial sepsis etc. However, 15% of the child deaths are due to either unknown diseases or without any knowledge of cause of death.

6.3 Socio-economic factors and child mortality

In socio-economic factors, the effects of ten prognostic variables viz., religion, type of caste, place of residence, family structure, educational level of mother, educational level of father, electrification, number of family members, occupation of mother and standard of living index on child mortality are examined by using chi-square test. And, the child mortality is found to have significantly different variations with type of caste ($\chi^2 = 8.709, p=0.033$), educational level of mother ($\chi^2 = 18.300, p<0.01$), number of family members ($\chi^2 = 6.178, p=0.046$) and standard of living ($\chi^2 = 12.300, p=0.006$). Again, after defining dummy variables of religion and type of caste, five socio-economic variables namely religion (Muslim), type of caste (ST), educational level of mother, number of family members and household’s standard of living which have been found significant in chi-square test are examined in unadjusted method of logistic regression model. Religion (Muslim), educational level of mother and number of family members are found to be significant. The religion of mother (Muslim) has significant effect on the survival status of their children as $\beta=0.853$ and $p=0.025$ after deleting the effect of other prognostic variables on them. The odds ratio for Relm is 0.426 with 95% C.I. (0.202–0.898) which is also statistically significant. Thus, the survival status of children born to Muslim mothers has 42.5 percent less than children born to mothers of other religion groups. In other words, the children born to Muslim mothers have
42.5 percent more chances of death than that of the other groups when the effects of other prognostic variables are eliminated. Similarly, the effect of educational level of mother (ELM) is associated with the survival status of child after neglecting the effects of other prognostic variables since $\beta$-coefficient for ELM is found to be $-0.853$ with $p$-value $=0.025$. Further, the odds ratio of ELM is $0.426$ with 95% C.I. $(0.202-0.898)$ and which is statistically significant. In case of number of family members (NHM), the unadjusted odds ratio for NHM is found to be $1.213$ with 95% C.I. $(1.028-1.431)$. This odds ratio suggests that an increase of one family member to existing members there is 21.3 percent more chances of child survival if the effects of other variables are deleted on it.

In adjusted method of logistic regression for a particular prognostic variable after controlling the effects of remaining prognostic variables, only one prognostic variable viz., number of family members (NHM) has significant impact on child mortality and its $\beta$-coefficient = $0.487$ with $p$-value for Wald’s test statistic is $0.002$. And, the odds ratio for NHM on child survival is $1.627$ with 95% C.I. $(1.200-2.204)$. Thus, it suggests that number of family members is increased by one there is 62.7.0% higher chance of child survival after controlling the effects of other 30 prognostic variables on them.

Further, step-wise logistic regression analysis is carried out with five socio-economic variables which have been found significant in chi-square test are considered as prognostic variables. In the analysis, only one socio-economic variable viz., number of family members has significant impact on child mortality. The odds ratio for number of family members on child survival is $1.587$ with 95%
C.I. (1.227–2.054). Thus, it suggests that number of family members is increased by one there is 58.7% higher chance of child survival. This variable is also one of the most important socio-economic factors influencing on child mortality because, this variable is found significant for all cases, whether the effect of other variables have been eliminated or controlling the effects of other variables.

Finally, it is concluded that five variables viz., type of caste, educational level of mother, number of family members and standard of living are associated with child mortality when we examine each variable one at a time. An examination of both unadjusted and adjusted effects of socio-economic factors on child mortality leads to a general observation. Although all the five variables have statistically significant unadjusted effects on child mortality, their adjusted effects are much smaller and are often not statistically significant except number of family members.

**6.4 Environment and sanitation factors and child mortality**

The prognostic variables under environment and sanitation factors considered in the present study are source of drinking water, type of cooking fuel, availability of windows, house type and type of toilet. In classical chi-square test, child mortality is found to have significant variation with different sources of drinking water \( (\chi^2 = 4.413, p = 0.036) \), type of cooking fuel \( (\chi^2 = 4.510, p = 0.034) \), availability of windows \( (\chi^2 = 6.450, p = 0.011) \) and type of toilet facility \( (\chi^2 = 76.364, p < 0.001) \). The children of the families with safe source of drinking water have higher chance of survival than those families without safe source of drinking water. Thus, source of drinking water has a significant impact on child
mortality. The child mortality is lower for children in households that use a smoke
free cooking fuel (25.42) than children in households using smoke produce cooking
fuel (58.82). In the study sample, 85.6 percent of the households are having any
window in their houses and only 14.4 percent houses have no window at all. It is also
observed that the child mortality rate is higher in households without any window
(88.44) than the households with windows (39.19). It has been revealed from the
analysis that the child mortality rate is very high in households having insanitary
latrine (253.33) as compared with households having sanitary ones (27.60). Hence,
type of toilet accessed by households and child mortality are highly associated.

All four significant environment and sanitation variables are considered as
prognostic variables in unadjusted method of logistic regression model and they are
again found to have significant effects on child mortality. The odds ratio for source of
drinking water is 2.920 with 95% confidence interval (1.091 – 4.096) and it is
statistically significant. Thus, it suggests that a change of source of drinking water
from unsafe to safe (i.e., from value 0 to 1), there is 2.920 times more chances of child
survival without considering the effect of other prognostic variables on them. The
prognostic variable viz., type of cooking fuel (TCF) has significantly unadjusted
negative impact on survival status of child, that is, there is decreasing chance of child
mortality due to the present status of the prognostic variable with respect to reference
category. The odds ratio of availability of windows is 2.379 with 95% confidence
interval (1.196, 4.729). It highlights that the chance of child survival is 2.379 times
higher in those houses having windows than those houses having no windows at all.
The type of toilet facility (TTF) (1 for sanitary & 0 for insanitary) has strongly and
substantially unadjusted effect on survival status of child with as β=2.481 and
p<0.001. And, the odds ratio of type of toilet is 11.920 with 95% C.I. (6.073−23.538) and indicates that the survival chance of child living at home with sanitary latrine is 11.920 times than the child living without sanitary latrine. It is concluded from the analysis that the unadjusted effect of type of toilet facility has highest effects among these environment and sanitation factors.

Again, these four prognostic variables are put in the adjusted method of logistic regression model and only one variable namely type of toilet has statistically high significant impact on child mortality. The odds ratio of type of toilet is 1.197 with 95% confidence interval (1.054 - 2.386). Thus, the survival chance of child is 19.7% higher in those household having sanitary latrine than those households having no sanitary latrine after controlling the effects of other variables. In step-wise regression analysis, only this variable has found to be significant effect on child mortality.

In summary, all environment and sanitation factors except type of house has significant unadjusted effects on child mortality but type of toilet has adjusted effect on child mortality. Thus, the type of toilet is the most important environment and sanitation factor which highly influences on child mortality.

6.5 Exposure to mass media factors and child mortality

Availability of radio and television in the household and mother’s exposure to mass media namely listening radio and watching television may reduce the mortality of her children because who are exposed to mass media are likely to have better access to information on health care services and ways of enhancing maternal
and child health. These factors may also act as an indicator of the economic status of
the family. Thus, in this analysis, availability of radio and television in house,
mother’s listening radio at least once a week, watching television at least once a week
and attending cinema hall or theatre at least once a month are considered to be
exposure to mass media. Only two mass media factors viz., availability of radio
($\chi^2=6.798$, $p=0.009$) and reading newspaper per week ($\chi^2=4.483$, $p=0.034$) are found
to have statistically significant effect on child mortality. Although, there is less
number of households owned radio, the child mortality rate is significantly high in
those households not owned a radio. For instance, the child mortality rate of those
households having no radio is 76.34 and the mortality rate for the households owned a
radio is found to be 34.84. Mothers who are reading newspaper at least once a week
have less chances of their children death (46.02 per 1000 children) than those mothers
who are never read the newspaper (59.48 per 1000 children). Henceforth, one may
confirm that reading newspaper once a week by mothers can reduce their child deaths.
Moreover, these two prognostic variables have significant unadjusted effect on child
mortality but they are not significantly adjusted effect on child mortality. It suggests
that the effects of availability of radio and reading newspaper per week have
statistically significant effects on child mortality when each variable is considered
separately one prognostic variable but the effects are not longer seen after controlling
the effects of other variables on them.

6.6 Biological/demographic factors and child mortality

The biological factors, commonly known as demographic factors are most
important and common endogenous covariates which influence on child survival. At
present, demographic factor is the only most significant factor influencing on child
mortality in both developed and developing but other factors such as socio-economic factors, environment and sanitation etc., are also important factors influencing on child mortality in developing countries. In the present study, eleven prognostic variables viz., present age of mother, number of children ever born, age of mother at 1st birth, number of living children, marriage to first birth interval, experience of abortion/ miscarriage etc., multiple birth, sex of child, pregnancy complication, parity, age at delivery, menstruation cycle, and maternal age at marriage are considered as demographic factors. In chi-square test, the child mortality is varied with present age mother, number of ever born children, age of mother at first birth, history of abortion/miscarriage, parity, age at delivery and menstruation cycle.

The child mortality rates are found to be high for the mothers of younger (15-19 year) age and older (45-49 year) as compared with other age groups of mothers. The highest child mortality rate is in the age group of 45-49 years (333.33) and it is followed by the age group of 15-19 years (208.33), age group of 20-24 years (55.56), age group of 30-34 years (41.15) and while age group of 35-39 years (40.32) and age group of 25-29 years has a minimum child mortality rate (26.92). The differential in child mortality due to age of mother is found to be statistically and high significant ($\chi^2=28.484$, p<0.01). This finding suggests that the risk of child death is high in those younger and older mothers i.e., the mothers of less than 19 years and above 45 years of age. The number of ever born children to mothers is divided into two categories as less than or equal to two children and greater than two. It has been revealed from the present analysis that child mortality rate is significantly higher to the mothers having more than two children (67.89) than that of the mothers of less than 2 children (30.91).
It is further witnessed that the mortality rates are very high for the children born to mothers whose age at first born is less than 18 years (109.68) and above 30 years (102.04). But it is comparatively low for the children whose mothers’ age at first born are in 19-25 years (32.92) and in 20-30 years (13.70). It can be reported from the analysis that age of mother at first birth has a highly significant effect on child survival. Besides, age of mother at first birth lies in between 18 years and 31 years has less chance of her children deaths. The child mortality rate for the mothers who have any history of abortion/miscarriage is found to be 75.89 while the mothers who didn’t any experience of either abortion or miscarriage have the rate of 37.58.

The child mortality rates for the parities 1-2, 3-4, 5-6, 7-8 and 9 & above are respectively 45.45, 37.19, 66.67, 250.00 and 200.00. It shows that children of lower and higher parities have higher chances of death. Moreover, child mortality and parity are exhibited U-shaped curve as child mortality is high in lower parity and it falls down in middle parities and again rise up in higher parity. On the other hand, the variation of child mortality due to parities is found to be statistically significant at 5% level of significance. Hence, child mortality is significantly differed with respect to different birth orders.

The child mortality rate has a significant variation with age of mother at delivery. Mother’s age at delivery less than or equal to 18 years and above 35 years have higher chances of their child deaths than that of the other age groups. The child mortality rate is 106.80 for the mothers whose age at delivery is less than or equal to 18 years and it is 142.86 for the mothers whose age at delivery is greater than 35.
years whereas it is 35.40 and 27.62 respectively in the age groups of mothers 19-25 years and 26-35 years. Further, It has been revealed that the mortality rate is high for the children born to mothers having irregular menstrual cycle (83.02) as compared with the children born to mothers having regular menstrual cycle (31.52). At the same time, the variation of child mortality rates so observed witnessed to be statistically high significant.

The number of ever born children, age of mother at first birth, history of abortion/miscarriage, age at delivery and menstruation cycle have significantly unadjusted effects on child mortality; and number of ever born children (TCB) has significantly unadjusted negative impact on survival status of child with odds ratio 0.802 and 95% confidence interval (0.693-0.927). Thus, an increasing of number of ever born children by one there is 80.2% unadjusted higher chances of child death. In other words, there is 80.2% less chance of child survival.

Age of mother at first birth (AM1B) has statistically and substantially an unadjusted positive impact on survival status of child as \( \beta \)-coefficient=0.079 with \( p=0.050 \). The odds ratio of AM1B for measuring the degree of impact on the survival status of child is found as 1.082 with 95% C.I. (1.00-1.172). This odds ratio speaks us that one year increase in age of mother at first birth there is 8.2% more chances of their child survival. History of mother for abortion or miscarriage (ABM) has a significantly negative impact on survival chances of child \( (\beta=-0.743, \ p=0.024) \) and odds ratio for ABM is 0.475 with 95% C.I. (0.249-0.908). Thus, mother has previous history of abortion or miscarriage is 47.5 % less chances of her child death than the mother having no any incidence of abortion or miscarriage earlier. Age at delivery
(AAD) and menstrual history are significantly unadjusted positive impact on survival status of child, that is, there is decreasing chance of child mortality when the present levels or values of these prognostic variables are increased one unit more in their respective units.

After adjusting the effects of other variables on them, there are two demographic variables viz., number of ever born children and parity have significant impact on child mortality. The prognostic variable total children ever born (TCB) has significantly negative impact of child survival as evident by β-coefficient=−2.608 with p-value<0.001. The odds ratio for the variable total children ever born (TCB) is 0.074 with 95% C. I. (0.017−0.313) and it indicates that an increase of one child there is 7.4% less chances of child survival or there is 7.4% more chances of child death when the effects other remaining variables are kept constant. In contrast to the finding of unadjusted logistic regression analysis, it is observed in the logistic regression analysis by adjusted method that the parity has a positive effect on child survival and its odds ratio is 8.069 with 95% C.I. (2.147−30.325). It means that an increase of order of birth there is 8.069 times higher chances of child survival. But, this finding contradicts the general norms of negative impact of parity on child survival as higher is the order of birth, lower is the survival chance of child. It may be due to interaction of this variable with other variables or due to confounding effect. By step-wise method of logistic regression analysis, these two variables have been selected as most significant factors which influence on child mortality. Thus, if total number of ever born children is up to 2 children, there is less chances of child death.
6.7 Breastfeeding and child mortality

The association of breastfeeding and child mortality is tested by $\chi^2$-test and it is found to be statistically high significant. Hence, one may preclude that breastfeeding and child mortality has strong association that children receiving breastfeeding has more chances of survival than the children who are not receiving breastfeeding.

The duration of breastfeeding is divided into two as less than 6 months and $\leqslant$ 6 months. The child mortality rate is found to be high when duration of breastfed is less than 6 months (500.00) as compared with children receiving breastfed six months or greater (26.32). On the other hand, the variation of child mortality rates according to duration of breastfeeding is statistically highly significant indicating the effect of the duration of breastfeeding on child mortality is highly significant.

The study sample of 836 children is classified into two groups according to the status of receiving plain water immediately after birth. It is observed that the child receiving plain water immediately after birth has higher chance of survival than other children who did not receive immediate plain water. Further, the relationship between child mortality and receiving plain water is found to have statistically significant ($\chi^2=8.067$, $p=0.005$). Thus, children receiving plain water along with mother’s milk immediately after birth have significant effect on child mortality.

In logistic regression analysis, unadjusted effects of duration of breastfeeding and plain water given to newly born baby are found significant. The odds ratio for
DBF (0 for $\geq 6$ months, 1 $< 6$ months) is 0.027 with 95% C.I. (0.013–0.058) and it suggests that the child mortality is 2.7% higher when the duration of breastfeeding is less than 6 months than it is more than or equal to 6 months. The odds ratio of plain water is 2.463 with 95% confidence interval (1.299–4.762) and it suggests that there is 2.463 times more chance of child survival when plain water is given to newly born baby after eliminating the effects of other variables on them. However, if the effects of other variables are controlled, there is adjusted effect of duration of breastfeeding on child mortality. The odds ratio for duration of breastfeeding (DBF) is 0.019 with 95% confidence interval (0.004–0.084). Thus, an increase of one month of duration of breastfeeding there is 1.9% less chances of child mortality after controlling the effects of other prognostic variables. Further, this variable is found to be one of the most significant prognostic variables among the set of variables which have associated with child mortality as witnessed by step-wise logistic regression analysis. In brief, it is said that although all the breastfeeding factors have strong and statistically significant unadjusted effects on child mortality, their adjusted effects are much smaller and are often not statistically significant except duration of breastfeeding.

6.8 Medical/health care factors and child mortality

The effects of medical/health care factors or determinants viz., use contraceptive, prenatal check up, antenatal visit, baby postnatal check up within 2 months, place of delivery, caesarean section, iron tablets/syrup supplement during pregnancy, antenatal care, vaccination of tetanus toxoid before birth, immunization of children like BCG, DPT three doses, polio three doses and measles are examined on status of child survival. The child mortality rate is significantly varied with all
medical/health care factors except baby postnatal check up within 2 months and delivery by caesarean section.

The children born to mothers with contraceptive use (15.15) have less chance of death than the children born to mothers who never use contraceptive (88.24). Hence, there is strong association between use of contraceptive by mothers and child mortality as evident by $\chi^2$-test which is found to be statistically high significant ($\chi^2=24.232$, $p<0.001$).

The frequency of antenatal visits for pregnant women is categorized into five groups viz., no visit at all, 1-4 times, 5-8 times, 9-12 times and 13 or more. The child mortality for the mothers who never visited at antenatal care centre is 89.89 and it is followed by 1-4 times visited mothers (37.45), 5-8 times visited mothers (19.53) and 9-12 times visited mothers have not any child death. Adversely, it is found that pregnant women, who had visited 13 or times, have high child mortality rate i.e., 142.86. This high rate of child mortality may be because the mother who might have more of pregnancy complications and severe health condition since their number of visits is much greater than normal visits. The differential in child mortality with respect to number of antenatal visits by pregnant women is found to be statistically and highly significant. Thus, number of antenatal visits has a significant impact on child mortality.

To examine the differential in child mortality according to place of delivery, it is classified into four types as home (include own home, home of relatives and others home within the village), public healthcare centre, private healthcare centre and
NGO/trust hospital/clinic. Child delivered at home is found to have highest risk of death (73.42 deaths per 1000 children) as compared with delivered in the places where medical facility are available viz., public medical centre (27.93 per 1000 children), private healthcare centre (12.50 per 1000 children) and NGO/trust hospital/clinic (0). The differential in child mortality according to place of delivery is statistically significant at 5% level of significance. Thus, child delivered at home has the highest risk of child death.

The child mortality rate is high to those children of mother who are not taken iron tablet during pregnancy (76.92) than those children of mothers who are taken iron tablet during pregnancy (22.42). Further, the variation in child mortality due to iron tablet supplement to mothers is found to be statistically high significant ($\chi^2=13.566$, $p<0.001$). Therefore, iron tablet/ syrup given to mother during pregnancy can significantly reduce child mortality rate to a great extent.

The child mortality rate for mothers who have never received tetanus toxoid before birth is found to be highest i.e., 93.02 and it is followed by mothers receiving once tetanus toxoid vaccine (50.00), twice (30.21), thrice (16.30) and fourth (0.00). $\chi^2$-test Shows that the tetanus toxoid injection before birth has highly significant effect on child mortality ($\chi^2=17.993$, $p=0.001$). Hence, tetanus toxoid giving to mothers before child birth can significantly reduce risk of their children death.

The child mortality rate for the mothers with antenatal care is found to be 33.13 and for the mother without antenatal care is 67.99. Further, $\chi^2$-test shows that there is significant effect of antenatal care on child mortality ($\chi^2=5.441$, $p=0.020$). It
may be due to the fact that antenatal care provide proper health knowledge to pregnant mothers and take care of by health professional which contributes to prevent any diseases that causes child death.

Information of immunization for children upto five years of age are taken into account as measure the impact of immunization on child mortality. It has been revealed from the analysis that child mortality rate is significantly and substantially reduced by giving vaccines viz. DCG, DPT, polio and measles.

The unadjusted effects of use contraceptive (CMT), tetanus injection before birth (TIB), prenatal check up by doctor (PRD), place of delivery (POD), iron tablets/syrup supplement during pregnancy (ITS), antenatal care (ANC), BCG, DPT, Polio (POL) and measles (MES) are found to significantly positive impact on survival status of child whereas their adjusted effects are much smaller and often not found statistically significant. On the other hand, DPT immunization to children is found to be significant effect on child mortality as evident by step-wise method of logistic regression. Hence, DPT immunization is one of the most important means of reducing child mortality.

6.9. Desire number of children and child mortality

The variation of mortality rates with respect to parent desired number of boys and girls are found to have statistically high significant as witnessed by chi-square test. Thus, it may be concluded that sex-preference has a significant impact on child mortality. However, these two variables have no unadjusted effect on child mortality but ideal number of girls has adjusted effect on child mortality. The odds
ratio for ideal number of girls (ING) on child survival is 6.195 with 95% C.I. (1.980-19.389) after controlling the effects of other variables. It shows that one unit change in ideal number of girls desired by parents there is 6.195 times higher chances of their child survival. And it is also significant in step-wise logistic regression analysis.

6.10 Estimation of survival function and construction of life table

Here, the Cox’s proportional hazard regression model is fitted to the data along with 31 covariates. The purposeful selection of variables and fix for a best subset of the covariates out of these 31 covariates has been conducted by stepwise method (Wald’s forward) with p-value 0.05 for entry level of a covariate in the model and 0.10 for deletion level of a covariate in the model. For assessing the best fit of the model particularly model coefficients, overall model and goodness of fit are conducted by Wald’s test, likelihood ratio test and score test. From this analysis, further, interpretation of the effects of covariates on the survival status of child is made with the help of relative risks ($e^\beta$) of each covariate.

In Cox’s regression analysis by stepwise method (Wald’s forward), coefficients ($\beta$) of covariates, standard error of $\beta$ estimates (SE), Wald’s test statistic values, p-values of Wald’s test, relative risks of covariates on child survival ($e^\beta$) and 95% confidence interval of relative risks are estimated. In first step, the DBF (duration of breastfeeding) is entered in the model and selected as the most important covariate out of 8 variables considered. In the second step, in addition to DBF, DPT is entered in the model and subsequently at the 6\textsuperscript{th} step, the six covariates viz., TTF (type of toilet), NHM (number of household members), CMT (use contraceptive), DBF (duration of breastfeeding), DPT and ING (ideal number of
girls) are entered in the model and these six covariates comprise the best set of the covariates which can be explained the survival status of child. These six covariates have negative relationship with the survival status of child.

The hazard ratio or relative risk of the covariate TTF is 0.159 and it is as little as 0.077 or as much as 0.330 with 95% confidence. It means that the hazard rate of child reduces by 15.9 percent in households with sanitary latrine as compared with the households without sanitary latrine, at any time and a reduction in the hazard rate of between 70.5 percent and 76.8 percent is consistent with the data. The hazard ratio of NHM is 0.713 with 95% confidence interval (0.609–0.839) and it suggests that the total hazard rate of child reduces by 71.3 percent when one member is increased at any time in the existing number of family members. And, the hazard ratio as low as 0.609 or as high as 0.839 is consistent with the observed data at 5% level of significance. The estimated hazard ratio of CMT (use contraceptive) by mother is 0.247 with 95% confidence interval (0.103–0.593) and it infers that risk of child death is 24.7% less in those children born to mother using contraceptive than those children born to mother not using contraceptive, throughout the study period. And the hazard ratio between 0.103 and 0.593 is consistent with the observed data at 0.05 level probability.

The hazard rate of duration of breastfeeding is 0.096 with 95% confidence interval (0.047–0.197). It suggests that child reduces by 9.6 percent when duration of breastfeeding is less than 6 months and it may be as little as 4.7 percent or as much as 19.7 percent with 95% confidence with the study data, at any time, keeping other covariates held constant. The DPT (diphtheria, pertussis, tetanus) vaccine given to mothers during pregnancy has likely to have 14.7 % less chance of their
child death as compared with others as evident by hazard ratio 0.147 with 95% confidence interval (0.066–0.323) keeping effects of other covariates constant. The estimated hazard ratio for ING (ideal number of girls) is 0.508 with 95% confidence interval (0.337–0.765) and it interprets that the hazard rate reduces by 50.8% for every one increase in ideal number of girls desired by parents and a decrease in the hazard rate of between 33.7 and 76.5 percent is consistent with the data.

The survival function at the mean of covariates denoted by \( \tilde{S}(t) \) and the estimated values of survival function \( S(t) \) are obtained by using Cox’s proportional hazard regression and finally the life table of children under study is constructed. One child is death before reaching one month after birth and the estimated survival chances of children within one month is 0.99473. The two children are died in between first and third months after birth and their survival chances at that time is 0.99717. Another one child is died at 6th month of birth and its survival chance is 0.94629. Similarly, the survival chances of the children on 8th, 10th and 12th months after birth are estimated as 0.99956, 0.85694 and 0.72724 respectively. At the end of the table, two children are died and the survival chance of the children on 58th month is 0.77214.

Further, it is observed that the survival chances of children are sometimes increase in some months and then reduces in other months i.e., there is no uniform trend of either decrease or increase of survival chances of children with respect to time. Hence, mortality pattern is varied with time during age of child.
6.11 Factor analysis on child mortality

The initial unrotated factor matrix is computed to assist in obtaining a preliminary indication of the number of factors to be extracted. This factor matrix contains factor loadings for each variable on each factor. Here, the factor loading which is greater than or equal to 0.40 are considered as important variables and each variable has only one loading on one factor that is further considered significant. However, some variables like DPT2, DPT1, DPT3, Polio1, etc have several moderate loading sizes, all of which are significant and job of interpreting the factors is much more difficult. The difficulty arises because a variable with several significant loadings must be considered in interpreting or labelling all the factors on which it has a significant loading. To interpret the factors meaningfully, the varimax rotation is applied to identify all variables which have significant loading on one factor. In this rotated factor solution, each of the variables has a significant loading (defined as a loading above 0.40). It is also known that factor loading is the correlation of the variable and the factor, the squared loading is the amount of the variable’s total variance accounted for by the factor. Thus, 0.857 loading of the variable DPT2 on Factor-1 translates to approximately 73.4% explanation and a 0.836 loading of POLIO2 translates to approximately 73.3% explanation and so on.

With this varimax rotation, a factor solution has been obtained in which all variables have a significant loading on a particular factor. Factor-1 has eight variables viz., DPT2, POLIO2, DPT1, POLIO1, DPT3, POLIO3, BCG and Measles, and assigns a common and suitable name as ‘Vaccination’. Factor-2 has five variables viz., prenatal check up by doctor, tetanus injections before birth, antenatal care, number of antenatal visits and iron tablets/syrup supplement during pregnancy,
and names it as ‘Prenatal & antenatal care’. Factor -3 has three variables namely age of mother at first birth, age at delivery and maternal age at marriage and a appropriate name is given to this variable as ‘Maternal age’. Similarly, Factor-4 has four variables viz., ideal number of boys, ideal number of girls, parity and total children ever born and a new name is given to this factor as ‘Fertility and sex preference’. The five variables are (educational level of father, educational level of mother, availability of windows, house type and standard of living) are included in 5th Factor and it is named as ‘Education & family condition’. Factor-6 has three variables viz., place of residence, source of drinking water and type of toilet facility and this factor is named as ‘Environment & sanitation’. The last and 7th Factor has three variables viz., frequency of listening radio, frequency of watching television and availability of radio and it is named as ‘Mass media’.

The objective of factor analysis in the present study is to create a smaller set of derived variables or factors to replace the original set of large variables for subsequent analysis of the effects of these derived variables on child mortality. Thus, factor scores are computed and logistic regression analysis is carried out to identify the effect of the newly extracted factors on child mortality.

The Wald test for the coefficient of the vaccination indicates that the vaccination contributes significantly in predicting the status of child survival. The odds ratio for vaccination is 3.725 with 95% confidence interval (2.610–5.317). This indicates that the chance of child survival is 3.725 times higher in those children who received vaccination than who did not receive vaccination after the effects of other variables held constant. The odds ratio is as low as 2.610 or as high
as 5.317 is consistent with the observed data at 95% confidence. Similarly, the Wald test for the coefficient of the prenatal and antenatal care is statistically significant, indicating that prenatal and antenatal care contributes in predicting survival status of child. Further, the odds ratio of prenatal and antenatal care is 1.600 with 95% confidence interval (1.126–2.273). This odds ratio suggests that the survival chance of child is increased by 60% by giving prenatal and antenatal care to the mothers, given other covariates kept in the existing levels. The odds ratio as low as 1.126 or as high as 2.273 is consistent with the observed data at 5% level of significance.

Although, other covariates viz., maternal age, fertility & sex preference, education & family condition, environment & sanitation and mass media have positively related with the survival status of child, but their effects on child survivorship are not statistically significant.

6.12 Recommendations

The present findings provide information of health planners and managers responsible for programmes to reduce child mortality. Encouraging effective immunization programmes to both children and mothers such as immunization of DPT, polio, BCG and measles to children; and vaccination of tetanus toxoid and iron tablets/syrup supplement to mother during pregnancy will greatly enhance the survival of children. Routine prenatal and antenatal check up by health practitioners and easy to assess healthcare services by mothers during pregnancy will reduce the chances of child deaths. Maintaining the age of mother at first birth reasonably in between 20-30 years of age by delaying pregnancy, discourage early marriage (before 18 years) and late marriage (above 30 years) and avoiding high-order births
will also substantially enhance survival chances of children during the first five years of life. Awareness of Family Planning Programme to couples to maintain less number of children will also help to reduce child mortality and no sex preference should be encouraged. Improving educational level of parents, standard of living and housing condition will substantially enhance survival chances of children. Use of safe drinking water and improving sanitary condition of household will greatly influence to reduce child mortality and hence it should be provided to each and every household. Mass media is one of the vital roles to reduce child mortality as the knowledge of healthcare can be easily accessed from it. Listening radio and watching television once a week by mother should be encouraged.