Estimation of Preterm Birth Rates, Associated factors and Child Survival in South Africa

Background: Generally, PRETERM BIRTH in known as "birth taken place before 37 weeks of gestation or 259 days of gestation". In other words, it is defined as deliveries occurring between 22 and 36 completed weeks of gestation. We also identified a category of "early preterm birth," comprising deliveries between 22 weeks and 34 weeks. So, Preterm birth Is the leading cause of neonatal/ infant mortality congenital anomalies. Death is disproportionately more prevalent among children born very early than the normal born children. Several studies have investigated long-term disabilities among survivors of preterm birth, including chronic lung disease, visual and hearing loss, and neurodevelopmental handicaps.

Some of the studies of long-term survival have been limited to the childhood period and have used low birth weight as a predictor rather than preterm birth. Very little is known about the long-term risk of mortality and overall health among persons born preterm. Therefore it leads to a heavy burden on families, society and the health system. We hypothesize that preterm birth is associated with not only fetal, infant, and childhood morbidity and mortality but also with adverse outcomes that persist throughout adulthood.

Generally, data on preterm deliveries are not found. There may be several reasons behind this, viz a viz, underreporting of the event, and there is not any standard definition of preterm births. That is why it is challenging to estimate it and make a comparison within and between countries. In low-income countries, despite many efforts, due to the lack of reliable data, preterm birth rates seems to estimate very difficultly. Although the United States reported a slight decrease in the rate of late preterm birth (34 to<37 completed weeks) since 2007 (Martin et al., 2011).

Factors associated with premature deliveries such as mother's socio-economic status including social group, religion, low level of education, and low family income. Physical factors include marital status maternal age at the time of marriage, multiple pregnancies, the birth interval between children, parity order and hazardous drinking, tobacco use because of stress. Except these, existing health issue such as hemorrhage vaginal bleeding, low body mass index (BMI). Usually, Preterm birth occurs when the mother is suffering from pre-eclampsia.

Preterm birth is still the leading cause of neonatal mortality in developing countries as well as the world. An increase in preterm births in the last two decades has raised the alarm among health policy-makers, including those in many countries. A recent study on this theme estimates and concluded that cases of preterm birth considerably rose in the last two decades in many developing countries comes under the top-ten most significant contributor of preterm births, worldwide (Blencowe et al., 2012) Therefore, the purpose of this study was **to assess the prevalence and Determinants of preterm birth, along with that also, to examine the associated health risks regarding the neonatal mortality which had preterm delivered**. Besides these outputs, demand and supply sides of the services and intervention programs can be examined, consequently.

Data Source: The study used data from the Demographic and Health Survey (DHS) acquired in South Africa (2016). It is a repeated cross-sectional data. This survey collects Information on a comprehensive set of variables at the individual, household, and community level. A representative sample of 15,292 households was selected for the survey.

In the current analysis, we considered women who had given births in the preceding 5-years to the survey. Such types of studies in South Africa can assess children along with maternal health and its development in recent years.

Methodology:

We used the number of pregnancies occurring from the last five years preceding the survey and births according to the gestational age as reported by the mother. The prevalence of preterm births was evaluated by Naegele`s rule of indirect estimation of the conception date.

Naegele`s rule: Generally, women gestation continues for an average of 266 days from the date of conception of the baby or 280 days from the first day of the last menstrual period (LMP). Franz Karl Naegele, a known obstetrician, developed an estimation method for calculating the date of delivery of the child that involved adding nine months and seven days to the first day of the last menstrual period (LMP). His estimation method was based on the assumption that a typical menstrual cycle lasts 28 days, with ovulation occurring on approximately day 14. The technique is known as Naegele`s rule, the indirect estimation of the time of conception.

For data analysis, descriptive analysis was done by evaluating the prevalence of preterm births and neonatal mortality across the categories of many independent variables. The study determined crude estimates or prevalence rate (PR) with 95 % confidence interval (CI). Stratification was applied in our study by sex due to the differences in survival pattern between boys and girls.

Survival analysis: A statistical method which analyzes data comprising Survival time which refers to a variable which measures the time from a particular inception time, to any specific end time point of the event., This technique is not usually applied because it is not found very often that data are 'censored' and normally distributed. Typically, a first step required in the survival analysis is that the estimation of the distribution of the survival times.

Cox's proportional hazards regression model: A prevalent model is that is used to asses the various covariates in survival data through the hazard function. The assumption behind this model is that the failure variable's distribution should be exponentially distributed. So, the model describes the effect of predictor variables on hazard ratio through the exponentiated part of the model.

The Stratified Cox regression model: it is a particular case of the model describes earlier. In this model, those covariates that do not satisfy the proportionality hazard assumptions of the model, those are applied as stratification of the other predictor variables and are also not included in the model.

Kaplan-Meier estimates: Kaplan Meier estimator is nonparametric, which requires no parametric assumptions. It is also calculated from two or more different groups by visual inspection of their respective estimated survival functions or some statistical tests.

Moreover, for the diagnosis purpose, distribution of deaths was also checked, and for the graphical assessment of the **Proportionality hazard assumption by plotting the Schoenfeld residuals** of each covariate against time. By the above results, it can be stated that the proportional hazard assumption approximately seems to be satisfied for all covariates. Furthermore, the smoothed curve is an almost horizontal line around zero.

After analyzing the dataset with the above three models, the Model comparison is performed to select the model that minimizes the negative likelihood by some of the

parameters, like, AIC and BIC criteria that highly reduce the -2Log L or the model that smallest AIC.

Description of the Variables:

Outcome variable- The outcome variable for this study is the risks of neonatal death, measured as the duration of survival since birth in days. This is defined as the risk of death of the child between birth and 28 days. The analysis in this study restricted to the live births in the last five years prior to the survey. Those children who have died before completing the 1st month or 28 days of their life are considered as cases, and they were non-censored, whereas children who were still alive at the time of the survey were treated as right-censored.

Predictor variables- Independent factors were encompassed some background characteristics of the women viz a viz, social group, religion, proxy variable for household income, i.e., Wealth Index, maternal factors such as maternal age, parity, maternal education, breastfeeding and preceding birth interval. We examined birth weight to assess the effects of child factors Mothers going for Full Antenatal care (Yes/No) Institutional delivery (Yes/No) and postnatal healthcare services receiving (Yes/No) were assessed by considering maternal health care utilization.

Conclusion:

This study aimed to assess the preterm births and examine the associated neonatal mortality. After the study, it is found that regardless of the category of age at gestational or age at death, mortality rates for boys are higher than rates for girls. This study tried to evaluate the preterm birth as a cause of neonatal mortality. Although, many studies have been done on this theme and they have already concluded an association between preterm births and associated long-term clinical consequences. However, in South Africa, by using DHS data, this study is perhaps the one study of very few ones which identified an association between life-threatening conditions of newborn babies and preterm births.

The study found that there is a trend for a rise in the prevalence of preterm births in South Africa. Other factors associated with preterm births such as twins, hypertension, and C-section could be related to an increase in morbid conditions of neo-natal babies. Thus, the medical condition of the mother is the primary factor which explains the rise in the prevalence of preterm births. Eclampsia affected women have increased the risk of preterm delivery by two times. Other indicators of severe maternal morbidity, e.g., hemorrhage. The presence of any sign of severe maternal morbidity or of a life-threatening condition during gestation increased the risk of preterm nearly two times in the study.

In addition, analyses can also identify possible risk factors associated with preterm birth, then this could help in regional policy-making to reduce the recent observed increase in the prevalence of preterm delivery.

References:

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