The Effect of Various Maternal Health Care Programs on Child Survival in India : An Assessment Using National Family Health Surveys

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Abstract

Early childhood mortality had declined considerably in India over the last few decades, but this decline was not uniform throughout the country. The most important population problem in many parts of India is fail to identify the causes for prevalence of very high infant- child mortality and to their consequences. Hence this study examines the effect of maternal health care programmes on infant and child survival in India. Data from the four rounds of the National Family Health Survey of India (1992 to 2016) were analysed to assess the survival chance of children under five year of age. Multiple & fourth order correlation used to investigate the influence of maternal health care programs on infant and child survival. Cox proportional hazard model were also used to understand the risk factors associated with early childhood mortality during 1992-2016.

Significant change was observed in infant and child mortality over the time period from 1992-2016. The results of multiple and partial correlation also strengthened this association. The value of R^2 comparatively low on NMR, point out the importance of biological factors that are responsible for high incidence of neonatal deaths. The partial correlation analysis shows the deviation of antenatal care variables which are highly correlated to the mortality indicators from NFHS-1 to 4 i.e., Delivery assistance by health professional is highly correlated with various mortality measures in NFHS-1, but in NFHS -

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2 it was change into iron and folic acid. Antenatal visit is highly correlated with childhood mortalities in NFHS-3 and NFHS-4. The Hazard rate and the probability density function were very high during the first month of life, which pointed out that the risk of dying during the first month of life of a new born baby was very high in India

INTRODUCTION

Maternal and child health programs play a key role in reducing infant and child morality in any population. Maternal and child health services can be defined as "promoting, preventing, therapeutic or rehabilitation facility or care for the mother and child" (WHO-1976). According to Indian culture mother is to be considered as the foundation of the family and children are the future of country. Thus maternal and child health services is an important and essential service related to mother and child's overall development. The Government of India had started maternal and child health care services in first five-year plan (1951-56). The integration of family planning services with maternal and child health care services and nutrition services was introduced as a part of the minimum needs programme during the fifth five-year plan (1974-79), resulted in a higher decline than the global average in under 5 mortality rate and maternal mortality ratio.

The maternal and child health programmes moved to a more focused and integrated approach through the Child Survival and Safe Motherhood programme in 1992. High coverage levels were achieved under the Universal Immunization Programme (UIP).After the International Conference on Population and Development (ICPD) at Cairo in 1994, India was again the first to have converted its guidelines in to the Reproductive and Child Health (RCH) Programme in 1997, which strengthen the health personnel to achieve goals of reduction of infant mortality rate and maternal mortality ratio to less than 30/1,000 live birth and less than 100/100,000 pregnancy respectively.The design and learnings of RCH Phase I defined the contours of RCH II, that was launched in the new millennium (2005). It also adopted the Integrated Management of Neonatal and Childhood Illnesses (IMNCI)

strategy which focus on children less than five years old — the age group that bears the highest burden of deaths from common childhood diseases such as sepsis, measles, malaria, diarrhoea, pneumonia and malnutrition.

Annually, 5.6million children under the age of 5 die worldwide, primarily in low-income and middle-income countries. Given that most of these deaths can be easily prevented or treated with cheap and effective interventions. According to Unicef, India has the highest number of under-5 deaths, with a total of 1.08million deaths in 2016. It is one of the six countriesthat contribute to 50% of the world's under-5 mortality rate (U5MR). On its own, India contributes to 19% of all under-5 deaths and 24% of all neonatal deaths. However, Infant mortality rate (IMR) and U5MR have declined over the years in India.

Health care services during pregnancy and childbirth and after delivery are important for the survival and well-being of both the mother and the infant. Antenatal care (ANC) can reduce the health risks for mothers and their babies by monitoring pregnancies and screening for complications. Delivery at a health facility, with skilled medical attention and hygienic conditions, reduces the risk of complications and infections during labour and delivery.

Maternal and child health programmes are critically important in a country like India, which is experiencing high infant and child mortality as well as maternal mortality. According to National Family Health survey-4 report, infant mortality rate in India was 41per 1000 live birth during the period 2015-16 and under five mortalities was 50. The IMR and MMR is a crucial indicator of human development in terms of social, economic and health factors though the rate has declined in recent years. The IMR is considered to be a sensitive indicator of not only the health status of population but also the level of human development in the context of education, economic condition, nutrition etc. In India, recent times there has been decline in MMR and IMR after a period of stagnation. The acceleration

in the pace of decline in IMR was noticed that in most states during 1982-92 (UNFPA-1997)

It was observed that childhood mortality had declined considerably in India over the last decades, but this decline was not uniform throughout the country. The various states are at different levels ranging highest in Utter Pradesh to lowest in Kerala. As everybody knows, the low childhood mortality is insurance to low fertility, but it cannot be true for all societies. Comparatively the south Indian states had reached low fertility, but the IMR is not as so low as one expected expect in Kerala. The regional variation in childhood mortality is very clear not only in the country as a whole but even at the state level also.

Today the most important population problem in many parts of India is to identify the causes for prevalence of very high infant- child mortality and to their consequences. Because Government of India had started maternal and child health care services in the first five-year plan (1951-56). The integration of family planning services with maternal and child health services and nutritional programmes was introduced as a part of Minimum Needs Programmes (MNP) during the fifth plan (1974-79) (Nair,et al 2000). But child mortality and maternal mortality in India still comparatively high.

Hence it is very interested to study the various antenatal care programme and survival chances of children in India and its trend since 1992, for various cohort using NFHS data series. The state and union territory level analysis will also give the details of survival chances of each children at both level. Since the child survival chances highly influenced by socio-economic health variables. This study, made an attempt to examine that linkage and effect of maternal health care programmes on infant and child survival in India. The data used for the study and the findings are given in the following section.

OBJECTIVES

□   To examine the effect of maternal health care programmes on infant and child survival in India since 1992 to 2016.

☐ To study the survival chances of children in India using Life Table Techniques.

☐ To analyse the effect of certain selected socio economic heath and demographic and maternal health care factors on child death using cox regression model

DATA AND METHODOLOGY

The analysis in this paper is based on four rounds of NFHS: NFHS-1, NFHS-2, NFHS-3 and NFHS-4 data, which were conducted during the periods between 1992 and 1993,1998-1999, 2005 and 2006, and 2015 and 2016.

The International Institute for Population Sciences is designated as a nodal agency for conducting the survey under the stewardship of the Ministry of Health and Family Welfare, Government of India (GOI). An important objective of the NFHS surveys has been provide national and state level estimates of family planning, maternal and child health, child survival, HIV/ AIDS and sexually transmitted infections (STIs), reproductive health, nutrition and socio economic conditions for India and each state/union territory. NFHS-4gathered information from 601509 households, 699686 women and 103525 men.15 In NFHS-3, interviews were conducted with 124385 women aged 15–49 and 74369 men aged 15–54 from all 29 states. NFHS -2, collected information from 91,196 households in 25 states, 89,199 eligible women and 32,393 children born in the three years preceding the survey.

NFHS-1 is a household survey which has a nationally representative sample of 88562 households and 89777 ever married women in the age group 13–49 years covering the population in 24 states and the National Capital Territory of Delhi.17 It may be noted that we have merged the sample for union territories into their nearby states, such as Andaman and Nicobar Islands and Puducherry merged into Tamil Nadu; Dadra and Nagar Haveli into Maharashtra; Daman and Diu into Gujarat; Lakshadweep into Kerala; and Chandigarh into Punjab. The states of Chhattisgarh and Jharkhand were modelled based on district information available in NFHS-1 to make it

comparable with NFHS-2, 3 and NFHS-4. Brief notes on the method used to reach the goal are given below.

Simple Partial and Multiple Correlation

It is a statistical tool used to measure the relationship between two or more variables such that the movement in one variable is accompanied by the movement of another variable.

Whether the correlation is simple, partial or multiple depends on the number of variables studied. The correlation is said to be simple when only two variablesare studied. The correlation is either multiple or partial when three or more variables are studied. The correlation is said to be Multiple when three or more variable are studied.

A brief note on the variables used is given below

Antenatal care: - Antenatal care (ANC) refers to pregnancy related health care provided by a doctor or a health worker in a medical facility or at home. Antenatal care can contribute significantly to the reduction of maternal morbidity and mortality because besides offering medical care, it provides also advice on appropriate diet and provision of iron and folic acid tablets to pregnant women.

Tetanus toxoid vaccination: - tetanus is an important cause of death among neonates in India. Neonatal tetanus is caused by infection of the new – born (usually at the umbilical stump) with tetanus organisms. Neonatal tetanus of course, is most common when the delivery takes place in an unhygienic environment and non- sterilised instruments are used for cutting the umbilical cord. Neonatal tetanus of course is preventable; two doses of tetanus toxoid vaccine given to the pregnant women one month apart during early pregnancy is nearly hundred percent effective in preventing tetanus among the new-born and among mothers.

Iron and folic acid tablets: - the provision of iron and folic acid tablets as a prophylactic against nutritional anaemia pregnant women forms an integral part of the MCH activities. It is recommended that a pregnant women take

100of iron and folic acid during her pregnancy and health workers are instructed accordingly.

Place of delivery and assistance during delivery: - from the stand point of child survival and health of the mother, the first priority for delivery care is that it is safe and clean (WHO,1994). The majority of the maternal deaths and instances of chronic morbidity of maternal deaths and instances of chronic morbidity resulting from child birth are due to the failure to get timely help at delivery(IIPS,92-93). It is essential that delivery takes place under proper hygienic conditions with the assistance of a trained medical practitioner.

Post neonatal mortality: The probability of dying between the first month of life and the first birthday.

Infant mortality: The probability of dying between birth and the first birthday.

Child mortality: The probability of dying between the first and fifth birthdays.

Under-five mortality: The probability of dying between birth and the fifth birthday.

Life table methodology

In this present study, life table were constructed (Ramkumar,1986; Namboodiri and Suchindran, 1987) in order to understand the survival chances of children up to the age of five. Here two events considered were birth and death of children and it is assumed that the second event has not been necessarily occurred. Those children who did not experienced the terminal event(death) is considered as censored cases.

The life table functions which used in this analysis are given below.

Column 1:   Age interval (duration of survival).
                    Each age interval consists of one month and after 12 months, interval is one year.

Column 2:   Actual number entering this interval (lx).

It gives the actual number of births who enters into the above age interval without censoring or experiencing the terminal events.

Column 3:   Number withdrawn during this interval (censored(Cx)).

It shows the number of right censored cases. The numbers withdrawn during the interval are those cases that do not experiences the terminal event during the tome of the survey.

Column 4:   Number exposed to risk (lx').

It gives the number of children who are exposed to the risk of dying,

lx' = lx-Cx/2

Column 5:   Number of terminal events(dx).

That is the number dying in the interval

ndx = nqx * nlx

Column 6:   Proportion terminating (probability of dying) in each age interval

nqx = ndx / nlx

Column 7:   The probability of surviving (npx)

nPx = 1- nqx

Column 8:   Survival function (Sx)

It is estimated by computing the continued product of Pi's

thus S (1) =1

S (2) = P1

S (3) = P1*P2….

S(i)=P1*P2……P(i-1) 1(i=1,2,3…)

Column 9:   The probability density function (fx)

fx = (Sx-Sx+n)/n,

where 'n' is the age interval

Column 10:   Hazard rate (λx)

The hazard rate expresses the instantaneous risk of having the event (death) in each age interval, given that the event do not occur before age x

i.e., $\lambda x = fx / Sx$

In this methodology, all individuals are assumed to have the same risk at any given time.

The Proportional Hazard Model

The single state survival model discussed in the above section help to identify important correlates of failure times. However, these models do not allow one to observe the covariate effects on failure time in multivariate context.

The Proportional Hazard Model propose by Cox in 1972 was a major attempt to overcome the above problems. This model allows the formulation of relation between a set of covariates and the survival function as in conventional multiple regressions.

The proportional hazard model is given by

$\lambda(t, Xk) = \lambda 0(t) \exp(Xk, \beta k)$

Where $\lambda(t, Xk)$ Is the hazard rate at time 't', $\lambda 0(t)$ is the base line hazard function, βk the vector coefficient and Xk is a vector covariate.

The hazard function allows estimation of relative risk of other group in relation to baseline group by exponent of the regression coefficient exp(â). Each exponnetiated coefficient represents the effect of a covariate on the hazard functions relative to a reference group. When there is no covariate present, the exp(â) terms reduce to unity. Values greater than unity indicate the relative risk of survival is greater for this group, compared with the reference group. Where values less than unity indicate a decrease in the risk.

Here, duration of survival of each individual is taken as the independent variable. The independent variable taken in this analysis are birth order, education and working status of women, religion, place of residence, place of delivery, sex. The variables used for the study were sets of categorical dummy variables. SPSS package was used for the analysis.

The explanation of the variable used for the present study are given below. The dependent variable used in this study are survival duration of children which is calculated in months.

Definition of variables

Duration of survival : survival time of each child, which is calculated in months

Age : age of the mother, (<20/ 20-34/ 35-49)

Birth order : Birth order of the child (first order/ 2-3 / 4+)

Education : Educational status of mother(illiterate, primary, secondary higher)

Occupation : Working status of mother (whether working or not)

Place of residence : Place of residence of the child (Rural/Urban)

Religion : Religion of child (Hindu/Muslim/Christian/ Others)

Sex : Sex of the child (male/female)

Birth interval : Preceding birth interval (≥24/ >24)

Wealth index : Wealth index of the child (poor/ middle/ rich)

ANALYSIS

Simple partial and multiple correlation were used for the analysis and the results are discussed in the following section.

Graph 1.1 depicts the trends of the percentage of various maternity indicators in India since 1992. All indicators have recorded a positive rise in

the last 24 years. Percentage of receiving antenatal visit rise from 20.3 in Nfhs-1 to 51.2 in NFHS-4. Percentage of receiving two doses of tetanus toxoid vaccine (29.2) and iron and folic acid (27.2) shows almost identical rise with in the last 24 years. From this graph, a dramatic increase can be seen in the level of birth delivered in medical institution and birth assisted by health professionals from nfhs-1 to nfhs-4. The government has been introduced successful policies like the RCH and NRHM programs in the health sector be the reason of rising these indicators from 1992.

1.1 Maternal Indicators of India (1992-2016)
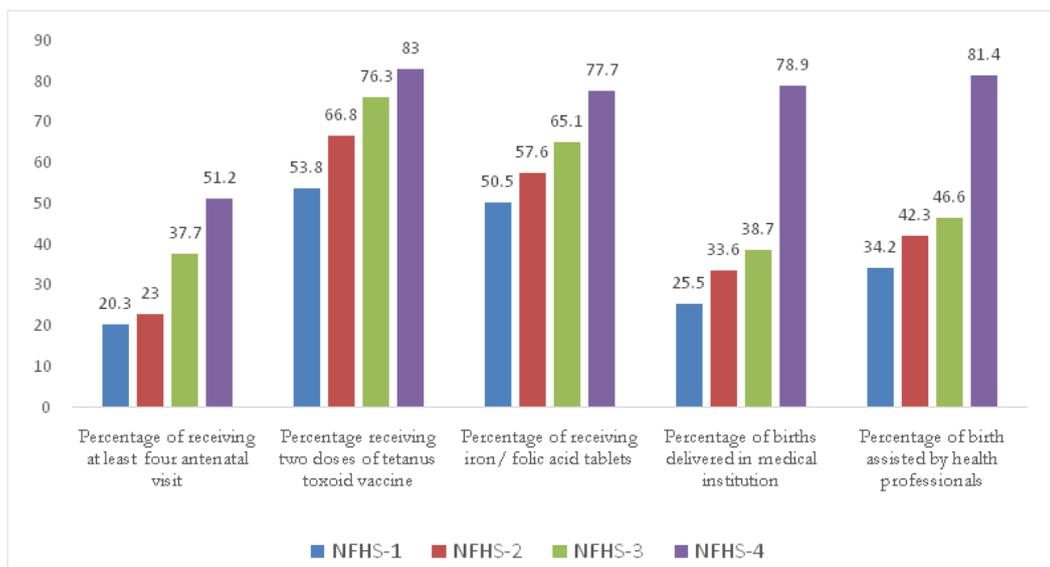
Graph 1.2 depict the trend of early child hood mortality since 1992 to 2016. The neonatal mortality rate declined from 49 deaths per 1000 live birth in NFHS-1 to 30 deaths per 1000 live births in the five years before the NFHS-4 (2015-16). During the same period PNMR declined from 29.9 to 11.3 per 1000 live births. The infant mortality rate declined to 48 over a period of 23 years. Child mortality rate in the five year before the survey1992-93 and the 2015-16 survey were 33.4 and 9.4.It is noted that the decline in the under-five mortality rate is slightly higher(from 109 to 49) than any other mortality indicator during the same periods.

1.2 Early Childhood Mortality Rates of India
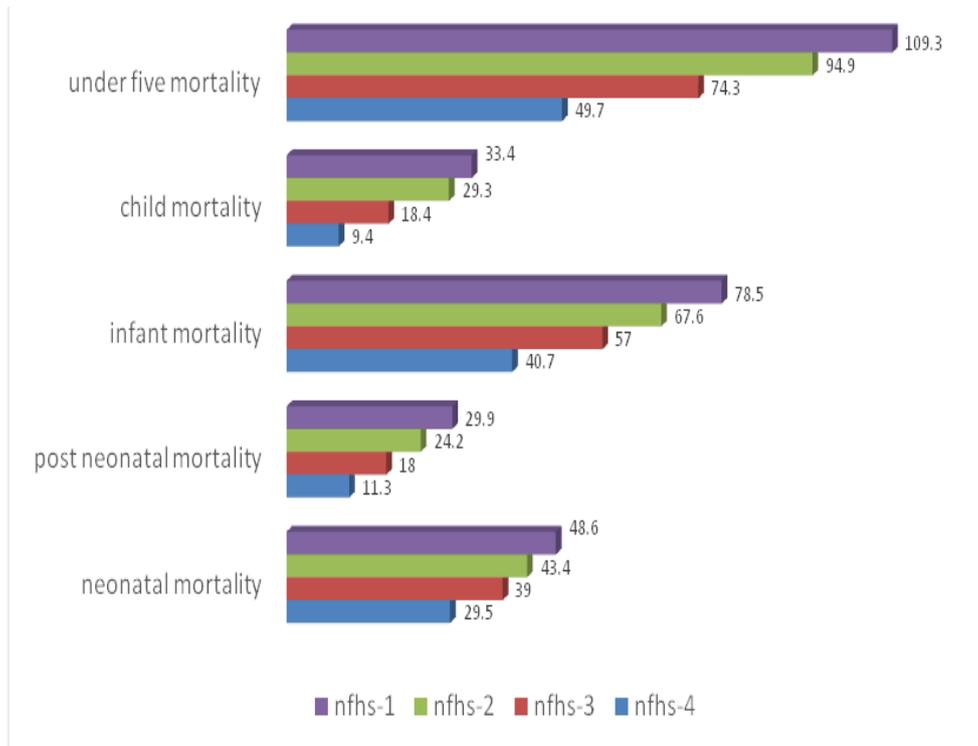
Table 1.1

Correlation Coefficient Matrix of Various Maternal Care and Child Mortality Indicators

	NFHS-1					NFHS-2				
	NMR	PNMR	IMR	Child Mortality	Under five Mortality	NMR	PNMR	IMR	Child Mortality	Under five Mortality
RECEIVING ANC	-.335	-.530**	-.436*	-.522**	-.499*	-0.5489	-0.7561	-0.6835	-0.7505	-0.7459
RECEIVING TT	-.063	-.337	-.186	-.487*	-.308	-0.5068	-0.7102	-0.6365	-0.731 7	-0.6845
RECEIVING I/F	-.224	-.435*	-.326	-.520**	-.419*	-0.6314	-0.7785	-0.7415	-0.7599	-0.7953
DELIVERIES MI	-.376	-.546**	-.468*	-.485*	-.509**	-0.5573	-0.7248	-0.6714	-0.5400	-0.6593
DELIVERIES ASSISTED HP	-.433*	-.611**	-.531**	-.560**	-.581**	-0.6165	-0.7547	-0.7201	-0.5954	-0.7014

	NFHS-3					NFHS-4				
	NMR	PNMR	IMR	Child Mortality	Under five Mortality	NMR	PNMR	IMR	Child Mortality	Under five Mortality
RECEIVING ANC	-.632**	-.809**	-.775**	-.843**	-.850**	-.556**	-.439**	-.592**	-.260	-.660**
RECEIVING TT	.090	-.237	-.023	-.135	-.067	.137	-.241	.047	.061	-.101
RECEIVING I/F	-.591**	-.799**	-.740**	-.809**	-.808**	-.486**	-.368*	-.498**	-.426**	-.560**
DELIVERIES MI	-.623**	-.789**	-.767**	-.793**	-.823**	-.293	-.362*	-.355*	-.365*	-.451**
DELIVERIES ASSISTED HP	-.591**	-.799**	-.740**	-.809**	-.808**	-.285	-.356*	-.347*	-.313	-.438**

Table 1.1 shows the correlation coefficient of various maternal care and childhood mortality indicators from 1992 to 2016. All the maternal care variables have high negative correlation with all childhood mortality indicators. The negative sign indicates the influence of reverse direction. From this table it can be seen that, in NFHS-1, the deliveries assisted by health personnel have comparatively high correlation with different childhood mortalities and it was changed to women receiving iron and folic acid tablets in NFHS-2. Again in NFHS-3 and NFHS-4 the indicator changed into the frequency of antenatal visit during the pregnancy period. It is evident from the table that the association between neonatal deaths and various maternal care indicators are significant, but the values are comparatively lower when compared to other mortality measures. This indicates that further attention should be paid to maternal care programmes, because factors affecting neonatal deaths are mainly biological in nature. In NFHS-4 the association with Child mortality values are also low with NMR compared with other indicators of child mortality. This indicates that further attention should be paid to reducing child mortality in India.

TABLE 1.2

Correlation and Fourth Order Partial Correlation Coefficient of Various Childhood Mortality Measures on Maternal Care Indicators

NFHS-1

Dependent variable (y)	R^2	Fourth order partial correlation coefficients				
		ry1.2345	ry2.1345	ry3.1245	ry4.1235	ry5.1234
IMR	0.469	0.193	0.423	-0.217	0.217	-0.508
NMR	0.436	0.202	0.473	-0.233	0.203	-0.495
PNMR	0.468	0.150	0.283	-0.160	0.206	-0.469
Child Mortalty	0.380	0.087	0.023	-0.143	0.228	-0.353
Under Five Mortlity	0.457	0.169	0.318	-0.204	0.240	-0.490

NFHS-2

Dependent variable (y)	R^2	ry1.2345	ry2.1345	ry3.1245	ry4.1235	ry5.1234
IMR	0.5158	0.0816	0.1081	-0.2669	0.0475	-0.1742
NMR	0.3435	0.2426	0.0045	-0.3834	0.1191	-0.1784
PNMR	0.6163	-0.1538	0.2092	-0.0361	-0.0690	-0.1190
Child Mortalty	0.5112	0.2470	-0.3205	-0.3649	-0.1012	0.2168
Under Five Mortlity	0.5158	0.1691	-0.0699	-0.3524	-0.0147	-0.0284

NFHS-3

Dependent variable (y)	R^2	ry1.2345	ry2.1345	ry3.1245	ry4.1235	ry5.1234
IMR	0.617	-0.317	0.043	-0.234	-0.268	0.237
NMR	0.429	-0.265	0.196	-0.255	-0.270	0.258
PNMR	0.717	-0.305	-0.381	-0.074	0.039	0.071
Child Mortalty	0.736	-0.499	-0.211	-0.258	0.059	0.256
Under Five Mortlity	0.730	-0.453	-0.049	-0.273	-0.211	0.275

NFHS-4

IMR	0.447	-0.473	0.251	-0.014	0.118	-0.056
NMR	0.475	-0.477	0.333	-0.057	0.177	-0.094
PNMR	0.216	-0.228	-0.164	-0.048	-0.118	0.136
Child Mortalty	0.286	0.234	0.115	-0.322	-0.190	0.102
Under Five Mortlity	0.472	-0.473	0.048	-0.068	-0.028	0.089

1. Antenatel care   4. Births delivered in medical institutions

2. Tetanus Toxoid vaccine   5. Deliveries assisted by health professionals

3. Iron/folic tablets

The multiple and partial correlation analysis were also done and the result given in table 1.2. all the R^2 values except child mortality are significant in 1992 period. The low value of R^2 on child mortality mentioned the importance of strengthening the maternity indicators during that period. But in NFHS-2 and NFHS-3 R^2 values were low on NMR, which underlined the importance given to the biological factors that are responsible for the high incidence of neonatal deaths. Again in NFHS-4 the R2 value lower on PNMR and child mortality it may be affected by environment factors. This table also indicates fourth order correlation coefficient of various dependent variables on independent variables. As earlier mentioned, in NFHS-4 deliveries assisted by health personnel have high negative correlation with mortality indicators and in NFHS-2 it was changed in to iron and folic acid receiving. Due to the initiation of new policies, there is an improvement in maternity indicators can be seen in NFHS-3 and 4 periods. It is evident from the table that compared to other indicators antenatal visit during pregnancy period affect child hood mortality.

Table 1.3 First, Second and third order partial correlation coefficients of various child mortality measures with third independent variable

	NFHS-1					NFHS-2				
	NMR	PNMR	IMR	Child Mortality	Under five Mortality	NMR	PNMR	IMR	Child Mortality	Under five Mortality
Y **5.1**	-.423	-.398	-.412	-.241	-.400	-.776	-.634	-.833	-.851	-.851
Y **5.2**	-.610	-.594	-.581	-.334	-.560	-.343	-.284	-.255	-.404	-.446
Y **5.3**	-.480	-.440	-.490	-.276	-.453	-.223	-.157	-.307	-.477	-.375
Y **5.4**	-.348	-.294	-.388	-.407	-.404	-.343	-.284	-.255	-.406	-.446
Y **5.12**	-.455	-.441	-.424	-.237	-.413	-.345	-.280	-.294	-.424	-.453
Y **5.13**	-.407	-.377	-.405	-.284	-.400	-.224	-.144	-.367	-.507	-.386
Y **5.14**	-.408	-.372	-.414	-.351	-.426	-.344	-.281	-.293	-.425	-.453
Y **5.23**	-.542	-.521	-.520	-.268	-.490	-.259	-.206	-.245	-.421	-.384
Y **5.24**	-.487	-.469	-.458	-.356	-.475	-.369	-.313	-.296	-.496	-.490
Y **5.34**	-.395	-.356	-.406	-.353	-.415	-.261	-.208	-.245	-.422	-.386
Y **5.123**	-.499	-.491	-.454	-.277	-.457	-.259-	-.197	-.298	-.450	-.393
Y **5.124**	-.481	-.464	-.450	-.334	-.464	-.368	-.320	-.305	-.499	-.490
Y **5.134**	-.408	-.373	-.414	-.357	-.426	-.261	-.199	-.297	-.450	-.395
Y **5.234**	-.48	-.462	-.452	-.348	-.469	-.317	-.262	-.280	-.489	-.452
	NFHS-3					NFHS-4				
Y **5.1**	-.776	-.634	-.833	-.851	-.851	-0.655	-0.390	-0.653	-0.303	-0.672
Y **5.2**	-.343	-.284	-.255	-.404	-.446	-0.313	-0.258	-0.369	0.199	-0.420
Y **5.3**	-.223	-.157	-.307	-.477	-.375	-0.567	-0.267	-0.554	0.064	-0.561
Y **5.4**	-.343	-.284	-.255	-.406	-.446	-0.583	-0.275	-0.568	-0.009	-0.581
Y **5.12**	-.345	-.280	-.294	-.424	-.453	-0.435	-0.225	-0.454	0.154	-0.453

Y **5.13**	-.224	-.144	-.367	-.507	-.386	-0.592	-0.270	-0.567	0.073	-0.563
Y **5.14**	-.344	-.281	-.293	-.425	-.453	-0.553	-0.294	-0.539	0.063	-0.561
Y **5.23**	-.259	-.206	-.245	-.421	-.384	-0.434	-0.224	-0.445	0.258	-0.456
Y **5.24**	-.369	-.313	-.296	-.496	-.490	-0.452	-0.230	-0.460	0.208	-0.475
Y **5.34**	-.261	-.208	-.245	-.422	-.386	-0.580	-0.269	-0.565	0.025	-0.574
Y **5.123**	-.259-	-.197	-.298	-.450	-.393	-0.482	-0.215	-0.477	0.242	-0.467
Y **5.124**	-.368	-.320	-.305	-.499	-.490	-0.463	-0.234	-0.466	0.219	-0.475
Y **5.134**	-.261	-.199	-.297	-.450	-.395	-0.561	-0.294	-0.542	0.066	-0.561
Y **5.234**	-.317	-.262	-.280	-.489	-.452	-0.451	-0.227	-0.458	0.234	-0.472

1.Antenatel care 2. Tetanus Toxoid vaccine 3. Iron/folic tablets 4. Births delivered in medical institutions 5. Deliveries assisted by health professionals

Table 1.3 indicates the first, second and third order partial correlation coefficients between various Antenatal care with various measures of child mortality since 1992.So here tried to study the relationship of highly related variable with childhood mortalities by controlling other variables has first, second, third order partial correlation and the results are given the table 1.3. In NFHS-1 the dependent variable, birth assisted by health personnel was comparatively low on child mortality& neo natal mortality, similarly in NFHS 4, also the influence of dependent variable, antenatal visit was low on these two mortality indicators. That means the child mortality may have affected by environment factors and NMR may be affected by biological factors

The results of correlation coefficient show the importance of antenatal care programs on pregnant women in society.

To study the survival chances of children in India (NFHS-4) using Life Table Techniques and analyse the effect of certain selected socio economic heath and demographic and maternal care factors on child survival using cox regression model given in following section

Table –1.4 Survival Analysis for children under 5 year of age, NFHS-4

Duration of survival	No. of entering in this interval	No. of withdrawn during the interval	No. of exposed of risk	No of terminal events	Proportion terminating	Cumulative surviving	Probability proportion	Probability density	Hazard rate
0-1	259627	1774	258740.000	7715	.029818	.970182	.970182	.029818	.030269
1-2	250138	3823	248226.500	785	.003162	.996838	.967114	.003068	.003167
2-3	245530	4073	243493.500	486	.001996	.998004	.965184	.001930	.001998
3-4	240971	4284	238829.000	419	.001754	.998246	.963491	.001693	.001756
4-5	236268	4405	234065.500	243	.001038	.998962	.962490	.001000	.001039
5-6	231620	4483	229378.500	185	.000807	.999193	.961714	.000776	.000807
6-7	226952	4351	224776.500	279	.001241	.998759	.960520	.001194	.001242
7-8	222322	4402	220121.000	139	.000631	.999369	.959914	.000607	.000632
8-9	217781	4453	215554.500	168	.000779	.999221	.959166	.000748	.000780
9-10	213160	4322	210999.000	143	.000678	.999322	.958516	.000650	.000678
10-11	208695	4079	206655.500	77	.000373	.999627	.958159	.000357	.000373
11-12	204539	3846	202616.000	63	.000311	.999689	.957861	.000298	.000311
12-24	200630	53309	173975.500	898	.005162	.994838	.952916	.004944	.005175
24-36	146423	49408	121719.000	198	.001627	.998373	.951366	.001550	.001628
36-48	96817	51401	71116.500	71	.000998	.999002	.950417	.000950	.000999
48-59	45345	45330	22680.000	15	.000661	.999339	.949788	.000000	.000000

Survival Analysis of children born during 2015-16 in India and its union territories are shows in table 5.4 The life table was calculated for the five years of life of children. In Inia 259627 birth were reported during this period among which 3.0 percent died during their first month of life, 4.2 percent died during their infancy period and 11884 (4.6 percent) before completing their five years of life. From the life table the probability of deaths in the first month, first year and under five years of life were calculated as follows;

$$1\text{-}S(1) = 1 - 0.970182 = 0.098$$

$$1\text{-}S(12) = 1 - 0.957861 = 0.0421$$

$$1\text{-}S(24) = 1 - 0.951366 = 0.0486$$

$$1\text{-}S(36) = 1 - 0.950417 = 0.0496$$

$$1\text{-}S(48) = 1 - 0.949788 = 0.0502$$

That is, the IMR is 42.1/1000 births. Out of this the NMR is 29.8 and PNMR is 12which indicates higher percent of the total infant deaths are concentrated during their first month of life. The hazard rate was 30/1000 live births which pointed out that the risk of dying during the first month of life of a new born baby was very high in India.

Table – 1.5 Cox Proportional Hazard Model

Hazard Ratio for Child Death Among Children Born During the Last Five Years (2015-2016)

Variables	child death=1,Child survival=0		
Socio demographic variables	Exp. (β)	95.0%CI for Exp (β)	
		Lower	Upper
Mothers age			
<20 ®			
20-34 *	.611	.273	1.367
35-49 *	.771	.339	1.753
Place of resident			
Urban ®			
Rural **	.968	.806	1.163
Religion			
Hindu ®			

Christian	.911	.753	1.101
Muslim **	.779	.605	1.003
Others **	.496	.305	.807
Caste			
SC/ST			
OBC	.961	.829	1.115
General*	.750	.603	.933
Education			
Illiterate ®			
Primary	.922	.762	1.114
Secondary	.894	.757	1.056
Higher*	.596	.402	.882
Sex of the child			
Male ®			
Female***	.836	.736	.949
Occupation			
Not working ®			
Working *	1.123	.967	1.304
Birth order			
First order ®			
e"2***	1.521	1.309	1.767
Birth interval			
d"24 ®			
>24 ***	.626	.550	.714
Wealth index			
Poor®			
Middle	.838	.689	1.019
Rich *	.759	.588	.980

***significant at 1 % level ** significant at 5 % level * significant at 1% level

Table 1.5 presents the hazard ratio for the child death in India and the 95 % confidence interval. From the table we can find that in India, as the mothers age increases the risk of death of children become higher. Considering the place of residence, the urban children have lesser chances of child death compared to rural children. Looking in to the religious composition it is noted that, the chances of death were comparatively higher among Christians and Muslims compared to Hindu children. The education of the mother shows a strong positive association with child survival. It is noted that those women who had higher education have lesser chances of death for their children.

While considering the sex of the child, it can be seen that the female children had lesser chances of death than male children. The table also shows that among working mothers the chances of death of their children were somewhat high compared to non-working mothers. As in the case of birth orderthe children born with enough spacing had lesser risk of death (>24 months) compared to children born with low birth interval. The wealth index of children shows a strong relation with child survival. That means, among the richer category the risk of having child death is 25 percent lowers as compared with poor women.

The analysis clearly indicated that education of the mother, birth spacing and wealth index shows significance influence in the child survival

Conclusion

This study made an attempt to investigate the influence of maternal health care programmes on infant survival in India and its changing trends. The data for the analysis were taken from NFHS-1 to 4 (1992-2016) reports of India and its union territories. The maternal care indicators considered for the analysis are recommended by WHO,ie, at least four antenatal visit during the pregnancy period, those receiving two doses of TT, receiving iron/folic acid, birth delivered in medical institution and deliveries assisted by health professionals

The different childhood mortality measures in India varies from 1992 to 2016. Similarly, there is a significant change can be seen in the maternity indicators before the last 24 years. From the stand point of child survival and health of the mother, the first priority for delivery care is that it is safe and clean. Inadequate care during delivery enhances the risk both to the mother and to the child.

All maternal care variable were highly correlated with different mortality measures in all the data series. The result of multiple and partial correlation analysis also supports this association. The value of R^2 on NMR and child mortality were low in NFHS-1 and NFHS-4 indicates the importance of biological and environmental problems. From the finding of partial correlation, it can be also seen that, in each series of NFHS data the effectmaternity indicator which affect the childhood mortality were varying, that may be the after effect of innovation of new policies by Indian government in health sector. Even though all the maternal care variables have some influence on child survival, the analysis indicates the need for further strengthening of maternal care services. After given priority in the field of mother and child health, further research emphasizes whymaternal and child mortality indicators are still high.

The variable such asMothers education, birth order, wealth index, basic facilities had influence on the child survival chances. In order to ensure the children's life in future acceptance of these maternal care programmes has to be strengthen further especially among the marginalized groups of the population Gave awareness about the ANC programmes particularly the importance of ANC visits. The planners and policy makers should consider these factors for better survival of our children and mothers. This study also underlines the importance of developing a strong information, education and communication programme with respect to maternal and child health care services.

REFERENCE

Dr. P. Mohanachandran Nair, Dr.AnilChandran.s and Dr.A.Sabu (2000), **"The Effect of Maternal Health Programmes on Infant and Child Survival in India"** Volume.46, (No. 1).

Singh A, Pathak PK, Chauhan RK, Pan W (2011), "*Infant and Child Mortality in India in the Last Two Decades: A Geospatial Analysis*", PLoS ONE 6(11)

Dr.P.Mohanachandran Nair and A.V. Suma (2003), "*Child Survival in India: An Application of Cox Regression Model*", Janasanghya,vol XXI, p 57-65

George T. Bicego and J. Ties Boerma (1993), **"Maternal Education and Child Survival: A Comparative Study of Survey Data from 17 Countries",** Journal of Social Science and Medicine, vol.36 (9), p-1207-1227.

National family health survey: *NFHS-1,2,3,4 reports of India and states* (1992-2016)

NazimHabibw and Lida Fan (2014), "*The Effect of Maternal Healthcare on the Probability of Child Survival in Azerbaijan*", international journal of Biomedical research, vol.20, p-6.

Susana Scott, Lindsay Kendall, Pierre Gomez, Stephen R.C, Howie, Syed M.A. Zaman, Samba Ceesay, MomodouJasseh (2017), **"Effect of maternal death on child survival in rural West Africa: 25 years of prospective surveillance data in The Gambia"**. PLoS ONE 12(2).

Singh A, Pathak PK, Chauhan RK, Pan W (2011), "*Infant and Child Mortality in India in the Last Two Decades: A Geospatial Analysis*", PLoS ONE 6(11)

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