ABSTRACT

Background: The decline in infant mortality rate of Maharashtra 12 points (33.3%) since 2005. As per the Sample Registration System report 2013, the neonatal mortality rate of Maharashtra was 11 points below the national level. Still about 65% of child deaths are during the neonatal period and about 27% child deaths are taking place after the neonatal period and before 1st year of birth.

Objectives: The objective is to study innovations in reducing infant and child mortality under National Rural Health Mission in the State of Maharashtra.

Materials and Methods: This study is conducted in district Pune which is one of the better performing districts in terms of child health care in Maharashtra to see programmatic factors affecting infant and child mortality in the district.

Results: It is found that district Pune has required health facilities at different levels as per GOI norms but lacks specialists. A large proportion of women still access government facilities for pregnancy - and childbirth-related services. High anemia among women and low birth weight (LBW) are important factors affecting infant and child mortality.

Conclusion: It is concluded that there are a few shortfalls in achievements that get accentuated when disaggregated by gender, rural-urban sectors and social groups at the grass root level. There is need to further strengthen Special Newborn Care Units at continuous home care level to address causes of deaths like LBW, asphyxia, congenital abnormalities, etc.

Key words: Child mortality, Child health services, Regional health planning, Focus groups, Maharashtra, Pune

INTRODUCTION

The infant mortality rate (IMR) is an important measure of the well-being of infants, children, and pregnant women. The Millennium Development Goal (MDG) 4 was set to reduce infant and child mortality by two thirds between 1990 and 2015. In the case of India, this would imply a reduction of the IMR and under 5 mortality rate (U5MR) to <28 and 41 per 1000 live births, respectively. The largest absolute numbers of neonatal deaths (10, 98,000) took place in India, accounting for 27% of global neonatal death (WHO, 2005).1

Every year, 27 million babies are born in country, out of which 1.2 million die during first 4 weeks of life according to the data from a report jointly combined by UNICEF, WHO, the World Bank and Save the Children.2 Over last 42 years, infant mortality has reduced from 129 per 1000 live births in 1971-83 to 41 per 1000 live births (Sample Registration System [SRS], 2013) in India. The U5MR goal for 2015 for India was fixed 38 per 1000 live births (UNICEF, 2009).3 However, India missed the deadline to achieve the MDG 4 to reduce child mortality by two-thirds (MoSPI, 2015),4 but the target is moderately on track due to sharp decline in recent years. Although IMR has been on a downward trend, the overall progress has been far from satisfactory owing to the continuing high rates of neonatal deaths that form the bulk of infant deaths. As a matter of fact, the share of neonatal mortality rate (NMR) in IMR has gone up from about 64% in 2005 to about 69% in 2012.

Maharashtra had one of the states in India with the lowest levels of U5MR in 2013 and is one of the better performers in terms of reduction in IMR. As per SRS 2013, the neonatal, infant and U5MRs of Maharashtra were 17, 24 and 26, respectively, which were much lower than the national average.
As shown in Figure 1, the NMR in 2013 for Maharashtra is 11 points below the national level. About 65% child deaths are taking place in the neonatal period, about 27% child deaths are taking place after neonatal period and before 1st year of birth.

**MATERIALS AND METHODS**

This is a descriptive and exploratory type of study. In this study, district Pune was selected as one of the best performer district in terms of infant and child mortality indicators in the state of Maharashtra. The study was conducted during December 2012 and primary as well as secondary both types of data were collected. Interviews were conducted with District Health Officer, Medical Officer In-charge of PHC Wagholi, and focus group discussion (FGD) was conducted with mothers with at least one living child of age 5 years or below at government health facility in the selected study area.

Semi-open ended interview schedules were used for collection of data regarding infant and child mortality (under 5 mortality), socio-economic conditions, diseases and causes of deaths among infants and children, mother and child health services, related HMIS data from the selected districts, programmatic interventions under National Rural Health Mission (NRHM), availability of services, etc. from the District and below health officials. Tools for FGDs were developed as per the framework given by Mosley and Chen. About 8-12 mothers in the age group of 19-35 years were invited to participate in FGD.

**Ethical Issues**

The research proposal was duly approved by the Academic Committee of the Institute from the technical as well as ethical angles.

**RESULTS**

**Programmatic Factors Affecting Infant and Child Mortality in the State**

The NRHM has transformed public health service delivery in the state. The state is making all efforts to improve maternal and child health indicators. Building evidence-based interventions and strategies are key to success in the state. Brief information on progress of activities is as follows:

**Matrutva Pratikshayalaya Yojna (Maternity Waiting Scheme)**

This scheme is implemented for difficult to reach areas where pregnant ladies (in advance stage) from hilly areas are brought to the maternity waiting halls in which besides the pregnant lady one relative attendant is allowed to stay and both get Rs. 100/- each a day up to maximum of 7 days.

**Infrastructure Improvement**

A total of 345 PHC have been strengthened with three Staff Nurses each to make them operational for 24 × 7 works. State has 365 Community Health Centres (CHCs) functioning on 24 × 7 basis and facility survey completed in 105 (including others health institution also). A total of 81 SDH, 365 CHC and 23 district hospitals were functioning in the state.

**Human Resource Development**

A total of 8100 sub-centers were functional with one auxiliary nurse midwife (ANM) and 4318 sub-centers were strengthened with the second ANM. State has appointed 272 contractual AYUSH doctors. As far as manpower augmentation is concerned, 407 specialists, 50 staff nurses and 5045 ANMs recruited on contractual basis. Special training programs such as Medical Officer Certification Programme, infant and young child feeding (IYCF), Integrated Management of Neonatal and Childhood illness (IMNICI), and facility based-IMNICI were introduced. Medical colleges are roped in for the advance training. All efforts are made to reaching newborn in community through efficient and trained accredited social health activists (ASHAs), Anganwadi Workers (AWWs), and ANMs and effective implementation of (i) Janani Suraksha Yojana and Janani Shishu Suraksha Karyakram (JSSK) (ii) IMNICI (iii) Home Based Newborn Care (HBNC) by ASHAs (iv) Navjat Shishu Surkasha Karyakram (NSSK) (v) Village Child Development Centre (VCDC) (vi) Breastfeeding through IYCF by Breastfeeding Promotion Network of India (BPNI) programme (HDP).

**Janani Shishu Suraksha Karyakram**

Under the implementation of JSSK during October 2011–December 2012, Institutional Deliveries benefitted by referral transport: 526,902, free diet beneficiaries: 485,527 (92%), sick neonates (up to age of 30 days) benefitted: 44,897, mother drop back-85% (until 6th February 2012), mother pick up-58% (until 6th February 2012). The state also conducts regular audits of maternal and child deaths in an effort to bring down the maternal mortality rate in the state.

**Home Based Newborn Care**

Maharashtra aims to decrease neonatal mortality and morbidity by providing essential newborn care to all newborns and prevention of complications, early detection and special care of preterm and low birth weight (LBW) newborns, ASHA is paid Rs. 250/ for conducting home visits for the care of newborn and postpartum mother. As per the detailed under the HBNC Training and Performance until December 2013, a total of 31,605 newborns examined by ASHAs and Rs. 68.76 Lakh incentive paid to ASHA for HBNC, 1071 LBW babies and 864 fever babies diagnosed and referred to health institution, 296 pneumonia diagnosed and referred to health institution, hypothermia babies are identified and managed to them at home level, 176 sepsis babies identified and referred to health institution.

**Newborn Stabilization Units**

This facility within or in close proximity of maternity ward is created where sick and LBW newborns are treated for short periods. Set up at FRIUs for stabilization of sick newborn referred...
from peripheral units. The state is equipped with 146 NBSUs at all institutional delivery facilities.

**Newborn Care Corners**

Established at all places where delivery is conducted for resuscitation of asphyxiated newborns and management of LBW newborns. There are 1029 Newborn Care Corners (NBCCs) at all facilities in the State. 80% of NBCCs are manned with trained Health personnel in NSSK.

**Special Newborn Care Units**

These were established in the state as the referral centers with the provision of care to sick newborn, LBW babies with other complications are managed by trained Pediatricians, MO’s and staff nurses at these units. There were 34 Institutes in Maharashtra with Special Newborn Care Units (SNCUs). Total SNCU admissions in the state: 25,000. Total deliveries 100,628, inborn 18,327 (18.21%), outborn 7760 (7.71%). The high-risk follow-up clinics for discharged babies from SNCUs were also established with the objective to know the incidence of chronic morbidities and adverse outcomes and timely interventions to prevent blindness/deafness and other neurological deficits ensuring good quality of life to babies. Achievements under this initiatives in terms of high-risk neonates who needed follow-up care were approximately 5000 high-risk babies.

**Infant and Young Child Feeding Practices**

It is a joint initiative of NRHM with UNICEF, ICDS, DWCD and RJMCHN,TOT’s done in 29 out of 33 districts. Total trainers prepared were 50. Under Baby Friendly Hospital initiative sensitization and district advocacy was done in 29 districts. A total of 45,000 persons trained in IYCF in Maharashtra until December 2012. Under the IYCF practices, “the breast crawl initiative” implemented jointly with DWCD, UNICEF, BPNI and RJMCHN. The BPNI and, in particular, Maharashtra has been actively working to promote awareness on the importance of breastfeeding. The Hirkani KaKsh initiative was taken for promotion of breast feeding among lactating mothers by providing special rooms with facilities for breast feeding at each health centers. A special cell opened at health centers where lactating mothers are taught and counseled about importance of breast-feeding. Hirkani KaKsh is now made available at 72 Primary Health Centers, all District Hospitals and all eight Women’s Hospitals in the State.

**Integrated Management of Neonatal and Childhood Illnesses**

Interventions are made through IMNCH across districts to reduce the neonatal and childhood mortality by addressing common neonatal and childhood diseases and by promoting exclusive breast feeding, immunization and improved diarrhea and ARI management.

**Addressing Malnutrition in Maharashtra**

Rajmata Jijau Mother-Child Health and Nutrition Mission set up in April 2005 was the only Mission in the country addressing Malnutrition. Child Treatment Centers (CTCs) first started in November 2007 for 21 days in health facilities like PHCs/rural hospitals. 90% Severely Acute Malnourished (SAM) children with no medical complications were managed at community level in VCDCs for 30 days in AWCs on day care basis. Budgetary Provision of about 18 crores was made for VCDCs in NRHM under Child Health PIP for 2012-13.

**Village Child Development Centers**

VCDCs are run for 30 days in Anganwadi centres. Children with SAM are given special diet 7 times a day. Since these children do not have any medical complications, aim of this feeding is to bridge the energy gap and rectify the micronutrient deficiencies. Over 52,800 VCDC camps held. Up to December 2012, around 353,750 malnourished children admitted for treatment. Improvement in 76% children was reported.

**Child Treatment Centers**

Initially started as Child Development Centres had two-way approaches. CTCs organized at Rural Hospitals and Sub-District Hospitals. Children with moderately acute malnourished (SAM/MAM) with medical illnesses are treated at these centers. Over 5038 CTC camps held since 2008 up to December 2012, around 37,565 malnourished children admitted for treatment. During 2010-2013, improvement in 70% children was reported. Mothers of malnourished children were also given diet and loss of daily wages. Demonstration of preparation of nutritious diet and counselling (on hygiene, sanitation, breast feeding stimulatory play therapy, family planning, etc.) also provided using audio visuals aids, flip charts, posters, etc.

**Nutritional Rehabilitation Centres**

Nutritional Rehabilitation Centre (NRCs) provide children with SAM with a 14-day treatment as per prescribed protocols of MOHFW, GOI, consisting of regular feeding with micronutrient-rich food and required antibiotics, de-worming, and treatment of underlying illnesses. Dedicated staff of one pediatrician, nutritionist, dietitian, nurses, caretakers, cook and a feeding demonstrator, cater to the medical needs of these acute patients, mostly under the age of 5, critically ill SAM/MAM children requiring pediatric services and intensive monitoring and those who did not recover in CTC are admitted in NRCs. Furthermore, work closely with mothers to address root causes of malnutrition in their child. By December 2012 around 600 malnourished children admitted and treated in Nutrition Rehabilitation Centers.

**Human Development Index Programme**

Human development index programme is aimed specialized services to provide quality antenatal care/postnatal care (ANC) to high-risk pregnant women, anemia lactating mothers, newborns and malnourished children. Loss of wages to pregnant women in the category of SC/ST/BPL in the ninth month is made (Rs. 800/- per woman) is compensated. Achievements reported under this program as around 10,220 camps organized up to December 2012. Over 308,828 pregnant and 187,859 lactating mothers examined and treated. A total of 191,866 children examined and treated by pediatricians.

**Rashtriya Bal Swasthya Karyakram**

Anganwadi check-up program for children between 0 and 6 years was included in school health check-up program. Separate structure for this program is created. The program has reach-out to newborns both at public health facilities as well as at home. Screening and managing preschool children from birth until 6 years for selected health conditions like birth defects, developmental delays, diseases and disabilities are an essential components of this program. Under the program, dedicated mobile block level teams both at the Anganwadi
Centre and local schools, and dedicated teams stationed at the District Intervention Centre. Existing Medical Officers, Staff Nurses and ANMs at all delivery points are also be included in the implementation process.

**Initiation of Infant Deaths Audit**

The state has been conducting child death audit since 2005 to understand the causes of deaths of children below 5 years of age. From April 2012 to March 2013, it has been decided to conduct infant as well as neonatal deaths audit across the state to focus primarily on the causes. During the year 2012, a total of 1650 infant deaths - 50 each from 33 districts was planned to be assessed to understand the prominent causes precipitating death. The Family Welfare Bureau under reproductive child health component has initiated the infant death audit in high-risk pockets of 33 districts.

**Findings from District Pune**

Pune is the second largest district in the state. District Pune has high decadal growth rate which indicates high urbanization in the district. The urbanization in the district Pune was 60.89%. The sex ratio in the district was 910 compared to 925 in State. The literacy rate was 87.19% compared to 88.91% for the State. As per Maharashtra Health Status 2010, the IMR of district Pune was 25. Regarding the status of Primary Health Services in the district, there were 539 sub-centers, 96 PHCs, and 21 CHCs. Out of these 8 PHCs and 61 sub-centres are in the tribal areas.

**Determinants of Infant Mortality in District Pune**

The data from HMIS (2011-2012) was studied to analyze factors affecting infant and child mortality in the district Pune.

**Antenatal Care**

Three ANC Checkups against ANC Registration was found to be low at 58.0% and this could be because of families in urban areas avail private nursing home facilities for ANC checkups, which is less reported. TT2 Booster and 100 IFA tablets given pregnant woman against ANC registration were 70.0% and 64.0%, respectively.

**Deliveries**

During the year 2011-2012, the reported deliveries against expected deliveries in the district were 80.2%, and the institutional deliveries against reported deliveries were 97.9%. The home deliveries were reported merely 2.1%.

**Births and Neonatal Care**

The percentages of newborns weighted against reported live births in the district close to completeness (98%). The percentages of LBW (<2.5 kg) in the district was 14%.

**Breastfeeding Practices**

As per the latest HMIS report of Pune, 60% newborn were breastfed within 1 hour of live birth. The percentage of newborns breastfed within 1 hour of birth against reported live births in Pune District appears to be under-reported and inconsistent with its percentage of institutional deliveries (97.9).

**Child Immunization**

The HMIS data on fully immunized children was 111%. However, immunization sessions held as a percentage of required VHNDs was 25%.

**Childhood Diseases**

Diarrhoea and dehydration are the major causes (70%) of childhood illness in the district. Respiratory infections in the district seems to be high (27.8%), which could be due to pollution mostly in urban areas. Malaria (1.4%) and vaccine preventable diseases (0.7%) were also recorded under HMIS.

**Causes of Child Deaths (Against Total Reported Infant and Child Deaths)**

From the HMIS data on causes of child deaths, it appears that Asphyxia, LBW, Diarrhea, Pneumonia are major causes of deaths among children. There is need to improve child death audit as nearly one-third deaths are reported due to other causes (Figure 2).

**Child Deaths by Age**

Pune District of Maharashtra is one of the better performing districts in terms of child survival indicators. The HMIS report shows the highest number of deaths (>50%) are taking place within 1 week in the district.

**Reported Child Deaths by Age**

As mentioned earlier, 67% of under 5 deaths are occurring during neonatal period. The child mortality indicators (against reported 1000 live births in HMIS 2011-2012) were NMR (19.5), IMR (25.7) and USMR (29.2) (Figure 3).

**Programmatic Issues at District Level**

To get the programmatic factors affecting child mortality, in-depth interview was conducted with Assistant District Health...
Officer (ADHO). He explained that district Pune has better child health indicators because of strong political will and the high literacy rate. They have very good road network and has better development indicators.

Factors Affecting Child Mortality
The major diseases affecting child deaths in the district were LBW, septicaemia, sudden infant death syndrome, diarrhea/dysentery and pneumonia. Jaundice, fever and common cough-cold were the common morbidity among the children. ADHO informed few malnutrition cases leading to child deaths in urban-slums.

Implementation of Child Health Programmes
It was informed that as a special measure for child health, Zilla Parishad has constituted Kuposhan (malnutrition) Trust. This trust coordinates with ICDS to distribute nutritional food through Anganwadi Centers. Regarding planning and implementation of child health program, it was informed that an MOU with medical colleges is signed which provide specialists and resources in holding camps fortnightly at block level and difficult to reach areas. There was free transport facility for emergency and referred patients at district hospitals. As a special initiative, free child heart surgery for poor families was arranged by the government. Zilla Parishad is running Sharada Gram Sanjivani Yojana to bring the IMR below 15 and provides Pediatric Care, Gynecology Care, ENT Care and Ophthalmic Care. At PHC level, ASHAs are involved in the identification of SAM and MAM Children in villages and provide them with special food.

Human Resource Management
MOU with Medical Colleges in the district is signed for availing services of specialists. Some positions filled on contract basis under NRHM.

Intersectoral Coordination
It was informed that there is MOU with Medical Colleges and they are fully involved in training in child health to staff of PHC/sub-center. Private sector is cooperating in immunization, surveillance, RNTCP, etc., and Medical associations have adopted remote villages and organize child health camp in collaboration with PHC in the area. PRIs also support for camp related activities. There is District Planning and Development Committee chaired by Guardian Minister for better coordination within Health Department. The ADHO informed that the Health Department has coordination among ICDS, Social welfare, Education Department, Woman and Child Health. In each Taluka, there is a Child Development Officer for better coordination with other departments. The social welfare department is supporting for handicapped children. The education department is providing spectacles to weak sighted children in civil hospital. NGOs are supporting in training, specialist services and provide mobile team to cover difficult to reach block called Vella. The Local Medical Association sometimes provides medicines/funds for organizing camps.

Training in Child Health
Under NRHM, Government of India has taken lot of initiatives for training in new schemes such as JSSK, NSSK, IMNCI, HBNBC and skill training for doctors and para-clinical staff. However, systematic and regular follow-up to check whether the knowledge/skill acquired in the training is transformed in the performance of the staff was suggested.

Referral Services
It was informed that the ambulance provided under the dial 102 scheme is used without any cost to patients. Besides, Village Health and Nutrition Committee fund is also provided to AWWs for referral transport. ASHA have mobile number of ambulance drivers and is contacted immediately in case of referral. There is referral register in the PHC/sub-center and treatment outcome of referral is recorded there.

Harmful Practices
It was informed that the PHC Khed in district had tribal community, and there are less institutional deliveries. The tribes have belief that if they cross the river (to go to the PHC for delivery) the child will not survive. There was another tribal community under Indapur PHC, the males go away for work/earn the livelihood, and ladies stay all alone. There is nobody to look after pregnant ladies and newborns, infants at home. Some tribes use home remedies, go to local Vaid for Jadi-Buti, they also have some blind faith and go to Tantriks.

Programmatic Factors at PHC Level
The PHC Wagholi situated about 20 km away from Pune City on NH 50 was selected for the study. It was informed that in the area, there were many stone mines that cause respiratory problems among children. Furthermore, water stagnates in the mines and cause malaria and dengue. There were some cases of infant/child deaths in a migratory/nomadic population in that area. Language barrier and trust issue is the major difficulty in reaching such population. The MO In-charge informed that under JSSK and Sharda Gram Yojana, ANC camps are arranged and medicines are given. It was informed that NGOs provide Rubella vaccine under IMPACT project. Self-help groups are involved by the government in providing food to mothers under JSSK scheme. Education Department helps in Pulse Polio Programme. It was also informed that one register is maintained about post-training follow-up of performance and every month report is sent to In-charge of District Training Team. It was told that now facilities are far better in PHCs due to NRHM and more people have started availing services from the PHCs.

Community Perceptive About Child Health
The brief excerpts of FGD conducted were: The mothers felt that the treatment facilities and services at PHC/sub-center are improved a lot. Credit for low morbidity among children goes the immunization program. Institutional deliveries have improved and mothers were aware of the benefits of early and exclusive breastfeeding. ASHA/ANMs do home visits and mothers found it useful for child health. Mahila Mandal, VHND meetings were not held in the villages but child health issues were discussed in “Bachaav-Gat” (Self Help Group). The mothers were aware of importance of minimum three Antenatal Check-ups. The community was aware of risk of anemia in pregnant woman and take balanced diet during pregnancy. The community informed that there is no discrimination against girl child in providing care. Blind faith persists during child illness in some pockets of tribes in the district.
DISCUSSION

In Maharashtra persistent malnutrition and widespread anemia in tribal areas in general and even in urban population continue to be a significant problem for children and adults in the state (NFHS-3). As per DLHS-III (2007-2008) report, the intake of IFA tablet in the state was 47.3% and in the Pune District, it was 55.9% contributing to LBW and also causing neonatal mortality in the state. Anemia is primarily linked to poor nutrition, and nearly half (48%) of women in Maharashtra are anemic. More than half of the women who are pregnant or breastfeeding are anemic in the state. About 36% of women are underweight.6

Early marriage is still prevalent in Maharashtra. As per DLHS-III report, 26.1% girls 15-19 year age group and 0.7% girls in 10-14 age groups are married. 17.6% girls are married below the legally permissible age. In Pune District, 17.3% of teenage girls get married before the minimum age of 18. Teenage fertility still remains a concern, and it has health implications for women neonates. Percentage of births to women during ages 15-19 years was 9.7% and varied across the districts. Percentage of births to women during 15-19 years to total births was 15.7 in Pune District. There is alarming drop in the child sex ratio (0–6 years) from 913 in 2001 to 883 as per the Census 2011 in the state. The Child Sex Ratio in Pune District is further disturbing low at 873.

In this study conducted in Pune District, it was found that there are some cases of infant deaths in migratory/nomadic population in that area. Language barrier and trust issue is the major difficulty in reaching them. However, Maharashtra has specific plans such as Matruva Pratikshayalaya Yojna and Sharda Gram Sanjivani Yojana to give focused attention in high burden blocks and reaching the innermost pockets/hamlets particularly those under forest cover.

Early devolution of primary health care implementation to the Zilla Parishads has been a special feature of Maharashtra’s health organization system which helped Maharashtra to gain an early lead among states to expand the rural health care infrastructure.7 Due care is taken to effectively cover tribal areas in the state. There is hardly any shortage of Doctors and Pharmacists. ANMs, Health Workers/Assistants (male/female) are in full strength. However, there is a shortfall of 21% in health facilities/infrastructure and acute (above 50%) shortage of Obstetricians and Gynecologists, Pediatricians and Specialists at CHCs.8-12

CONCLUSION

 Provisioning of health facilities in the state of Maharashtra needs to be structured in the context of the sizeable tribal and nomadic population spread across several districts. The recommendation for the district is to focus essential interventions aimed at reduction in the IMR of the socially and economically disadvantaged groups. Higher focus is essential on interventions aimed at a reduction in NMR through establishing SNCUs and NBCCs.

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