

Implementation of a Pilot Test mHealth Application to Improve Home Based Newborn Care (IMNCI) in Remote Tribal Gujarat

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ABSTRACT

India has adopted a neonatal component to Integrated Management of Childhood Illness (IMCI), creating IMNCI. In the era of Digital India initiatives, we reviewed the appropriateness of an electronic IMNCI/IMCI, the barriers to adherence and potential of Information and Communication Technologies (ICT) for evaluation and management of young infants (0-2 months). An Audit of local and national challenges related to IMCI/IMNCI practices was performed accompanied with a review of local and global mHealth initiatives that have demonstrated success in exploring and collaborating ICT with IMCI/IMNCI practices.

IMNCI algorithm for evaluation and management of neonate and young infant has a good sensitivity and specificity for referring cases with severe illness. However, gross deficiencies have been identified in the areas of long-term knowledge and skill retention among trained workers, lagging refresher training, referrals of young infants, non-availability of a trained

paediatrician at rural or block level health facilities coupled with poor healthcare seeking in the postnatal period. Diagnostic discordance between IMNCI algorithm and IMNCI trained medical officers' or health workers' decision is also of concern. IMCI Computerised Adaptation and Training Tool and similar approaches leveraging ICT have demonstrated reduced training time, improved adherence, potential cost-effectiveness and quality data collection to strengthen program implementation and policy decisions. Smartphones have developed advanced computing capabilities, which is why development of a mobile application (app) to digitise the algorithm, to reduce the cognitive load on the peripheral worker, and to enhance utilisation of IMNCI is in process.

India should pilot test m-IMNCI prototype targeting present implementation challenges as decision support technologies have considerable potential to improve coverage and quality of health care for the poor.

Keywords: Childhood illness, Health, Neonate, Practices, Prototype

INTRODUCTION

According to UNICEF in 2016, 2.6 million neonates died globally, of which South Asia was responsible for over a million of these deaths, and 0.6 million deaths were accounted for by India alone [1]. Up to 1 million died within the first day of life, with close to 1 million dying within the next six days, estimating 7000 newborn deaths every day within the first week of life. Taking into consideration the under-five deaths in 2016, 24.8% deaths occurred in the South Asian region with the largest number of deaths nationally occurring in India (0.9 million) [1]. With these appalling statistics, India has managed to surpass African countries such as Nigeria and the Democratic Republic of Congo as reported by the Global Burden of Disease Study in The Lancet [2]. Currently, India's under-five, infant and neonatal mortality rates are at 50, 41, and 25 deaths per 1000 live births, respectively. Neonatal deaths in India, contribute to almost 30% of neonatal deaths worldwide [3], primarily caused by preterm births (24%), asphyxia (19%), infection (29%), and other causes accounting for 20% deaths [4]. As most of these deaths occur during the first week of life and continue to remain higher up to the second month of life, India adopted IMCI (Integrated Management of Childhood Illness) with a 'neonatal' component of care, creating IMNCI.

With India's transition towards digitisation, and rural India growing at a much higher rate than urban India, mobile-IMNCI (m-IMNCI) represents a promising innovation for improving child health outcomes, as it improves health care provider and caretaker perception of the clinical encounter and warrants further investigation into this technology. Where universally acceptable treatment algorithms are already available-like in IMNCI; the feasibility, usability,

utilisation, scalability, and cost-effectiveness studies are key areas for pilot testing. mobile-IMNCI (m-IMNCI) and its benefits over traditional IMNCI approaches.

IMNCI strategy: Under RCH (Reproductive and Child Health), IMNCI remains a key strategy to curb child mortality which adopts a multi-prong approach including care of newborn, infants and children up to 5 years of age, training of grass root health service providers, home visits, strengthening health facilities and supply logistics, and promoting family/community-based child care practices. With a substantial proportion of neonatal deaths occurring in the home [5], integrated approach of home and community-based IMNCI and Facility-based care (F-IMNCI) is essential to provide a continuum of quality care for severely ill newborns and children from the community. Unfortunately, majority of the health facilities including 24x7 PHCs (Primary Health Centres), FRUs (First Referral Units) and CHCs (Community Health Centres) do not have trained paediatricians to provide specialised care to the referred sick newborns and children [6]. Therefore, capacity building of facility-based health professionals and administrators alongside community health workers is deemed essential.

Objectives of IMNCI:

- Equity in access and utilisation of services
- Case management training
- Improvements to family and community practice
- Strengthening health systems and logistics supply
- Effective collaboration and coordination at different levels and with grass root organisations
- Follow-up, monitoring, and supportive supervision

Current issues with IMNCI implementation: While most indicators suggest favourable implementation and coverage of IMNCI in the country, the IMR and NMR are yet much higher than ambitious SDGs which are aiming to reduce NMR to at least 12 and U5MR to at least 25 in all countries by 2030 [7]. Progressive states like Kerala (NMR:6, IMR: 13) and Tamil Nadu (14,19) are doing much better than many other non-high focus and high focus states, according to SRS 2015 estimates [8]. While improvement in services has been observed over time, enormous implementation challenges still exist, especially in remote tribal areas where people reside in scattered clusters. Moreover, our understanding of tribal areas suggests that there are likely chances of under reporting of neonatal and young infant morbidities and mortalities owing to illiteracy, geographic isolation, lack of awareness, poor health-seeking behaviour and socio-cultural norms guiding newborn care practices.

Studies from urban slums, rural and tribal blocks of South Asian countries also revealed that healthcare seeking in postnatal period was universally low. In addition, private health care providers and village level faith healers were preferred for seeking treatment of newborn danger signs and childhood morbidities because of cultural and religious beliefs, poor access to health facilities, and financial barriers [9]. The status of some desired household practices such as frequent feeding and giving extra fluid to drink during episodes of illness was poor-emphasising the need for targeted behaviour change communication to expand family and community knowledge, demand for services, and strengthen health care delivery at village, community and family level [10-13].

Cross-sectional studies from Vadodara, Panchkula, and Purulia assessing the skills of frontline workers identified need for further reinforcement among community health workers regarding hand washing, active feeding and feeding during illness, assessment of young infants, the correct way of identification and classification of danger signs [14-16]. As poor supervision and inadequate essential supplies affect the performance, measures need to be taken to improve supportive supervision, availability of essential supplies, and monitoring of the program, if the IMNCI strategy has to translate into improved child survival in India [17]. Lack of funding for follow-up, inadequate number of trained supervisors and inadequate job aids for follow-up were identified as commonest challenges to follow-up in a multi-country survey [18]. Long-term knowledge and skill retention among trained workers is another challenge, advocating the need for timely refresher training, follow-up after training, on-job supervision, periodic skill assessment and supportive feedback to boost up the decline in the knowledge and skills [19,20].

Integrating ICTs into IMNCI: A strategic yet timely transition towards digital health by leveraging the smartphone revolution:

Despite the proven effectiveness of clinical decision support systems and indigenous expertise in information technologies, India has not fully utilised the potential of these technologies in public health services, beyond the level of health management and information systems and few selected mobile-health and telemedicine projects.

Global evidence: Several approaches to overcoming barriers to IMCI implementation are currently being tested globally. One of these is IMCI Computerised Adaptation and Training Tool (ICATT) - an innovative software technology for IMCI training which has been tested in several settings (in regional languages) including Tanzania (Kiswahili), Peru (Spanish), Indonesia (Bahasa) and East Java.

D-Tree International has been working on the development of an electronic version of IMCI (e-IMCI) in Tanzania-The software runs on a PDA or mobile phone and guides health workers step-by-step through the full IMCI assessment, classification, and treatment plan. E-IMCI can reduce training time, skipped steps, branching-logic errors, and miscalculations. Initial findings indicate that lack of computer skills did not pose any challenge, and clinicians in rural Tanzania were enthusiastic about e-IMCI. The study demonstrated

improved clinical and potential cost-effectiveness of Electronic Decision Support Systems (e-DSS) compared to paper-based algorithms by improving adherence of health workers. The e-DSS implementation led to better health outcomes and more rational use of antimalarial drugs and antibiotics [21]. Caretakers also expressed a positive view of e-IMCI, noting improved service from providers, more thorough examination of their child, and a perception that providers who used the personal digital assistants were more knowledgeable [22].

Current digital health initiatives in Gujarat, India: Previously, an innovative mobile phone application ImTecho was introduced and implemented in rural Gujarat by Sewa Rural, Jhagadiya [23]. Literally meaning "support" in the vernacular, the application served to improve the performance of local health workers by offering better supervision, support, and motivation for increasing coverage of maternal, newborn and child health interventions among resource-poor settings. Its mobile phone application linked with a web interface stationed at a local PHC facilitated better collaboration between the supervisors and grassroots team and addressed critical implementation challenges such as replenishment of supplies, performance management, regular payment of incentives etc. The underlying motto was that a support and supervision system resulted in better performance of the health workers which in turn led to improved health [23].

In support of India's transition towards digitisation, the government conceived a nationwide broadband network "BharatNet" which will be available and accessible on a non-discriminatory basis. The primary goal is to provide affordable broadband connectivity of 2Mbps to 20Mbps to all households and institutions in partnership with states and the private sector [24]. The objective is to facilitate the delivery of e-governance, e-health, e-education, e-banking, internet and other services to rural India and is scheduled to begin from March 2018 [24].

In light of increasing penetration of smart phones, usage of mobile internet and better network connectivity in most of the parts of Gujarat, m-IMNCI seems a strategic proposition to overcome implementation and supervision challenges concerning home-based newborn care. Additionally, the data from m-IMNCI can be analysed to assist with supervision and to provide health program managers and policy makers with a wealth of population health data.

Moreover, platforms like ImTecho allow ample opportunities for seamless integration of IMNCI algorithm and easy adoption by frontline health workers, allowing for future scale-up and sustenance.

A case for action-getting down to brass tacks: Innovative approaches can be defined as "novel, or newly packaged, potentially scalable interventions, aimed at improving coverage and utilisation of quality services across the continuum of maternal and newborn health care to improve outcomes [25]". In light of the above discussion and evidence of proven effectiveness of ICTs in training and implementation of IMCI guidelines, a prototype design and field testing of integrated electronic decision support system (eDSS-IMNCI) in local dialect based on IMNCI treatment algorithms is called for, which can be tested among medical, para-medical and frontline health workers. As the software can automatically navigate through algorithms it will be more efficient than paper-based flipcharts and can ensure easily customised updates on protocols based on the most recent clinical evidence for the region.

Moreover, the smartphone-based m-IMNCI prototype can also be utilized for peer support and motivation through videos of community members delivering key health education messages and advocating desired newborn care practices at the household level. Furthermore, the prototype has been designed to include training videos for the care providers as well as maternal education and awareness videos on key IMNCI care practices to improve their knowledge of home-based care practices. Most importantly, the prototype will eliminate

the need for preparing monthly IMNCI reports and its compilation, as all the data captured into the prototype can automatically generate the monthly reports as per the prescribed government format. Thus, it could help eliminate the issue of inadequate registers, maintaining of records, data validation, and reporting.

We are happy to report the approval of a research grant by the Indian Council of Medical Research, New Delhi, allowing our team to test the efficacy of electronic decision support system to improve adherence to IMNCI guidelines for neonates and young infants by medical officers and frontline workers in tribal settings. The objectives of this study will be to design and develop an electronic clinical decision support system based on IMNCI algorithm for 0-2 month age-group, in a local dialect following interactive design process in consultation with IMNCI experts, regional health administration and end-users. The prototype is to be implemented in a study block to assess the effectiveness in terms of acceptability, usability, adherence to IMNCI algorithm and overall impact on newborn care practices and child health outcomes. The project will be spearheaded by primary investigators who are IMNCI and FIMNCI experts with more than 50 and 10 programs in their repertoire respectively. Their previous work has led them to many international platforms where they have presented their findings and consulted with other experts to develop a logical framework for this proposed study. Other team members include senior public health coordinators who have instrumental project development and implementation experience as well as operational rapport with the tribal populations that will prove to be crucial towards the successful implementation of this study. The smartphone app of the IMNCI algorithm will allow for geotagging and ensuring that reports are not filled for the sake of filling them. It also allows for backend measurement of the number of times the app was accessed and the time which was needed by the healthcare worker to complete the process of evaluation. In this way, the health system can filter out those entries which have been done with the intent of collecting incentive-based remuneration. During the process of quality checks of another study by the investigators, they were able to detect fraudulent entry at home by field staff due to geotagging and the amount of time taken to enter data. The detailed methodology of the project is beyond the scope of this current manuscript and will be published separately.

CONCLUSION

IMNCI is an excellent program for reduction of under-five mortality which faces challenges in implementation at various levels. Leveraging the smartphone revolution and integrating it with deep data mining and artificial intelligence can ensure that the program is implemented effectively. ICMR has recently funded the authors for the various ideas laid out in the paper and we expect to report on the accomplishments in due course of time.

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