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Commentary

# Technology-driven Neonatal Health Care in Low-resource Settings: Expectations and Reality

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Neonatal mortality is the highest contributor to childhood mortality and is disproportionately concentrated in low- and middle-income countries [1,2]. Unavailability of trained neonatal care providers is one of the foremost contributing factors for high neonatal mortality in such countries [3]. Even many healthcare facilities lack trained neonatal care providers in low- and middle-income countries [4]. Neonatal care training of physicians, midwives, nurses, and traditional birth attendants can improve neonatal outcomes, also via decreasing mortality [5]. However, there is increasing data showing that the competence of trained birth attendants decreases because of skill loss over time [6]. Mobile health interventions (mHealth) can provide a point of care guidance to the grass root level neonatal care providers and have been proposed as a solution to the aforementioned problems. mHealth interventions have been projected to be bridging the gap for delivering evidence-based interventions through trained and untrained care providers until the patient gets to a facility capable of providing an adequate level of care in low- and middle-income countries. The data on the applicability of mHealth interventions in low- and middle-income countries is promising but weak [7] especially for neonatal healthcare-related mHealth interventions [8].

Recognizing the need for evaluating the impact of mHealth clinical decision-making tool on neonatal outcomes, Amoakoh and collaborators conducted a cluster-randomized control trial of a mHealth clinical decision-making support intervention providing emergency neonatal protocols for frontline health workers involving sixteen districts of eastern Ghana [9]. The mHealth intervention included phone calls, text messaging, access to the internet, and access to an unstructured supplementary service data. This trial showed that pre-intervention risk-adjusted odds of neonatal mortality were 2.09 times higher (95% CI (1.0; 4.38), $p = 0.051$) in the intervention arm compared to the control arm.

The investigators must be lauded for their efforts to conduct the trial. However, the results of this study must be taken in the context of some limitations. The intervention and control groups had baseline differences including rates of home births, maternal age, gestational age, rates of operative and assisted delivery, maternal education, and insurance. It is important to note that all of the baseline differences were skewed in favor of the control group. Maternal and neonatal risk factor differences were not assessed or adjusted due to data limitations. Baseline differences in healthcare availability, participating hospital characteristics, workflow, staffing, and case severity were also present and not used for adjustment in the analysis. The study did not adequately follow the implementation of mHealth intervention. The use of unstructured supplementary service data request as a surrogate marker for uptake would potentially be inaccurate as it accounted for only 2% of the total mHealth related requests. User characteristics, its impacts on mHealth usage with individual component variability, and individual mHealth components usage with its practical application were not analyzed which might have provided better insight. Assuming that mHealth would be useful in critical neonatal illnesses, neonatal deaths and unstructured supplementary service data requests were not corresponding which raises the question of penetration and actual usage of mHealth by the health care providers. The increase in neonatal mortality in both groups is concerning for an overarching factor at play which may be related to geopolitical, social, or health policy changes not captured in the present study.

Although the study results, contrary to the expectations, are negative, they serve an important role to guide future studies with similar objectives. This study fundamentally highlights that the problem of perinatal and neonatal mortality is a complex one. Programs for reduction of perinatal and neonatal mortality ideally should include multipronged comprehensive care package strategies rather than just increasing the availability of information to healthcare providers through mHealth interventions. Cluster designs might lead to baseline differences as occurred in this trial but also may show reduced efficiency by design effect [9,10]. However, many interventions such as community and educational interventions are not amenable to individual randomization. Studies with bigger sample size and conventional randomized control design might provide more reliable results. Future studies focusing on individual components of mHealth and detailed evaluation of end-user characteristics (like age, sex, education, comfort

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levels for operating mobile phones, prior training, work experience, etc.) with individual mHealth component preferences and application are warranted. Importantly, future trials on neonatal mHealth interventions would have to carefully include the possibility of harm (given the outcomes of this study).

## Authors' Contribution

Both authors contributed equally to write the commentary.

## Declaration of Competing Interests

The authors have nothing to disclose.

## References

[1] Levels and trends in child mortality; 2018https://data.unicef.org/wp-content/uploads/2018/10/Child-Mortality-Report-2018.pdf, Accessed date: 11 June 2019.
[2] Leisher SH, Teoh Z, Reinebrant H, et al. Seeking order amidst chaos: a systematic review of classification systems for causes of stillbirth and neonatal death, 2009–2014. BMC Pregnancy Childbirth 2016;16(1):295.
[3] Darmstadt GL, Lee AC, Cousens S, et al. 60 million non-facility births: who can deliver in community settings to reduce intrapartum-related deaths? Int J Gynaecol Obstet 2009;107 [Supplement].
[4] Manasyan A, Saleem S, Koso-Thomas M, et al. Assessment of obstetric and neonatal health services in developing country health facilities. Am J Perinatol 2013;30(9):787.
[5] Patel A, Khatib MN, Kurhe K, Bhargava S, Bang A. Impact of neonatal resuscitation trainings on neonatal and perinatal mortality: a systematic review and meta-analysis. BMJ Paediatr Open 2017;1(1).
[6] Eblovi D, Kelly P, Afua G, Agyapong S, Dante S, Pellerite M. Retention and use of newborn resuscitation skills following a series of helping babies breathe trainings for midwives in rural Ghana. Glob Health Action 2017;10(1):1387985.
[7] McNabb M, Chukwu E, Ojo O, et al. Assessment of the quality of antenatal care services provided by health workers using a mobile phone decision support application in northern Nigeria: a pre/post-intervention study. PLoS One 2015;10(5):e0123940.
[8] Sondaal SF, Browne JL, Amoakoh-Coleman M, et al. Assessing the effect of mHealth interventions in improving maternal and neonatal care in low- and middle-income countries: a systematic review. PLoS One 2016;11(5):e0154664.
[9] Amoakoh HB, Klipstein-Grobusch K, Agyepong IA, Zuithoff NPA, Amoakoh-Coleman M, Kayode GA, Sarpong C, Reitsma JB, Grobbee DE, Ansah EK. The effect of an mHealth clinical decision-making support system on neonatal mortality in a low resource setting: a cluster-randomized controlled trial. EClinicalMedicine 2019. https://doi.org/10.1016/j.eclinm.2019.05.010.
[10] Donner A, Klar N. Pitfalls of and controversies in cluster randomization trials. Am J Public Health 2004;94(3):416–22.