ORIGINAL ARTICLE

Assessing the Effect of Integrated Health Interventions on Maternal and Neonatal Health Outcomes in an Aspirational District of Uttar Pradesh: A Mixed Method Study

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ABSTRACT

Background: Maternal and neonatal mortality remain major public health challenges in India, particularly in aspirational districts like Shrawasti, Uttar Pradesh. Birth asphyxia and postpartum haemorrhage (PPH) are leading causes of preventable deaths, necessitating integrated interventions to improve outcomes. **Aims & Objective**: To assess the effect of integrated interventions on maternal and neonatal health outcomes, with focus on birth asphyxia and PPH, and to compare pre- and post-intervention complications in Shrawasti. **Methodology**: A retrospective observational study analyzed quantitative data from labour rooms of the district hospital, four community health centres, and the special newborn care unit (SNCU) in Shrawasti. Qualitative insights were derived from in-depth interviews with healthcare providers. Based on baseline findings interventions were implemented between June 2022 and May 2023. **Results**: SNCU admissions due to perinatal asphyxia declined from 67% to 42.3% (P <0.001). Stillbirths reduced from 3.5% to 1.9% (P = 0.001), while PPH decreased from 6.6% to 3.9% (P <0.001). Neonatal mortality also showed a declining trend (22.6% to 17.9%). Qualitative findings highlighted rational oxytocin use, effective training, improved staff behaviour, enhanced patient awareness, and strengthened documentation as key contributors to improved outcomes. **Conclusion**: Integrated interventions substantially improved maternal and neonatal health in Shrawasti. Addressing misuse of oxytocin, strengthening training, enhancing awareness, and improving documentation were pivotal in reducing adverse outcomes.

KEYWORDS

Asphyxia Neonatorum, Maternal Health, Infant Health, Postpartum Hemorrhage

INTRODUCTION

India has made remarkable progress in improving maternal and neonatal health (1,2). However, persistent challenges remain, including limited healthcare access, inadequate infrastructure, and cultural barriers (3). Globally, neonatal mortality continues to be a major concern, especially in low- and middle-income countries (4,5). Birth asphyxia accounts for approximately 8.5% of under-five mortality and poses a significant economic burden on families (6,7). Gaps in addressing key determinants of maternal and neonatal health are evident, particularly in managing birth asphyxia and its associated factors. For instance, the misuse of oxytocin significantly increases the risks of birth asphyxia, stillbirth, and neonatal encephalopathy, indicating limitations in current interventions (8–12).

This study focuses on Shrawasti, an aspirational district in northeastern Uttar Pradesh targeted for rapid development. Since 2018, Shrawasti has demonstrated notable progress, with a 37.8% improvement in the Health & Nutrition theme, rising from a delta ranking of 97 (28.13%) to among the top ten districts by 2023 (13,14). This makes it an important case for examining effective strategies in maternal and neonatal health. The study aims to compare maternal and neonatal outcomes before and after interventions and identify factors contributing to reductions in postpartum hemorrhage, newborn deaths, stillbirths, and birth asphyxia.

MATERIAL & METHODS

Study type & design: This was a mixed-method study comprising a retrospective observational design for the quantitative component and qualitative in-depth interviews with healthcare providers.

Study setting: The study was conducted in Shrawasti district, Uttar Pradesh, across public healthcare facilities including the District Combined Hospital (DCH), four Community Health Centres (CHCs— Ikauna, Sirsiya,

Malhipur, and Gilaula), and the Special Newborn Care Unit (SNCU).

Study population: The quantitative component included all mothers and newborns recorded in labour room registers and SNCU data from the selected facilities, while the qualitative component involved healthcare providers, specifically staff nurses and Auxiliary Nurse Midwives (ANMs).

Study duration: The study was carried out over one year (June 2022 to May 2023), with baseline data collected from June to August 2022 and post-intervention assessment conducted in three quarterly phases up to May 2023.

Sampling Procedure: The district of Shrawasti has five blocks, each with a Community Health Centre (CHC). For this study, four CHCs were selected based on their geographic distribution and patient load. The CHC closest to the district hospital was excluded due to its lower delivery rate, ensuring a representative sample from higher patient load centers.

Quantitative Data Collection: This retrospective observational study was carried out in the Shrawasti district of Uttar Pradesh. The data collected was the one reported in labour room registers at government healthcare facilities, i.e. four Community Health Centers (CHCs) - Ikauna, Sirsiya, Malhipur, and Gilaula– and the District Combined Hospital (DCH) and from the Special Newborn Care Unit (SNCU) of the Shrawasti district, reported on a monthly basis over the span of one year and was provided on request by district government office (Supplementary document). This comprehensive data included information on neonatal mortality, birth asphyxia cases, stillbirths, and postpartum hemorrhage (PPH). Data from SNCU related to neonatal mortality, and admission with birth asphyxia was used to evaluate the impact of the health intervention. Similarly, from DCH data collected, PPH, birth asphyxia and still birth rate was used to assess the impact of health intervention by comparing these events at baseline and 3 monthly thereafter till 12 months. Birth asphyxia was defined based on APGAR scores document in records. STATA 14.2 was used for statistical analysis. P value less than 0.05 was considered statistically significant.

Qualitative Data Collection: A significant component of this study was the qualitative data collected through in-depth interviews (IDIs) with staff nurses and Auxiliary Nurse Midwives (ANMs) at the CHCs and DCH. Health care providers (ANMs and staff nurses) were chosen as they are predominantly involved in the conduct of normal vaginal delivery at labour room of CHCs and DCH.Informed consent was taken from all the participants prior to in-depth interviews. These interviews delved into practices and attitudes surrounding the administration of uterotonics, documentation, and reporting of asphyxia and PPH cases. A total of 10 interviews were conducted, including 7 with staff nurses and 3 with ANMs.

The interviews were recorded and initially transcribed in Hindi. These transcripts were then rigorously cleaned and translated into English for a detailed qualitative analysis. The English translations were imported into the QDA Miner Lite software for thematic analysis. This process involved identifying relevant codes from the transcripts, which were then grouped into categories and themes. This thematic approach allowed for a nuanced understanding of the effect of healthcare interventions on staff practices and patient outcomes.

Intervention and Monitoring: Key interventions were implemented in the district with joint efforts of administrative and healthcare officials along with other partner agencies active in healthcare, based on the initial findings from data collection and discussions with healthcare officials. These included the safe and responsible use of oxytocin, awareness programs for labour room staff, and strategies to mitigate data underreporting. A second intervention focused on increasing accountability and transparency in healthcare practices, including rigorous monitoring and staff motivation against data underreporting. Continuous assessment of these interventions was carried out to gauge their effectiveness in reducing birth asphyxia and PPH rates.

Data Organization for Intervention Assessment: Before data collection, a discussion with various health officials of Shrawasti district divulged that postpartum haemorrhage (PPH) and neonatal asphyxia were the prevalent causes of maternal and neonatal mortality. Precisely, improper use of Oxytocin, a surge in deliveries before shift changes, and reluctance among families to transfer newborns suffering from asphyxia to the Special Newborn Care Unit (SNCU), outdated practices, lack of knowledge and awareness and inadequate monitoring were identified as the contributing factors. To tackle these challenges, comprehensive interventions were implemented across both healthcare and administrative domains. The officials actively involvedwere District Magistrate (DM), Community Development Officer (CDO), Chief Medical Officer (CMO), Chief Medical Superintendent (CMS), Additional Chief Medical Officer (ACMO) ,Medical Officer-in-charge (MOICs), Special Newborn Care Unit/ Newborn Care Unit/ Labour Room (SNCU/NBSU/LR) staff of District Hospital (DH) & Community Health Centers (CHCs). The data were systematically organized into four quarters: baseline data from June to August 2022 (Q1) before the intervention, September to November 2022 (Q2) after the first intervention, December 2022 to February 2023 (Q3) post the second intervention, and March to May 2023(Q4). This segmentation was instrumental in evaluating the interventions' effect on maternal and neonatal health over time.

Ethical Considerations: The Institutional Ethical Committee granted ethical clearance for the study (RMCHRC/ACADEMIC/Ph.D./1989B/06/08/2023 dated 05.09.2023).

Participants' Consent: The informed consent was obtained prior to the in-depth interview from all the participants. In all cases of participants anonymity was maintained.

RESULTS

Quantitative Data

Status of Maternal and Neonatal health: The study reports the data collected from the labour room of both CHCs and DCH of Shrawasti district and SNCU of district hospital. The CHCs are located at Sirsiya, Gilaula, Ikauna

and Malhipur blocks.The total deliveries reported in LR from the CHCs, and district hospital were 14623. The baseline represents the data collected before the intervention, from June to August 2022. On the other hand, Q1, Q2, and Q3 represent the three quarters after the intervention: September to November, December to February, and March to May 2023, respectively.

Trends shows that as compared to before the start of the intervention (6.6%), there was a significant decline in proportion of mothers with PPH in 1st(5.6%), 2nd(3.6%) and 3rd(3.9%) quarter (P<0.001) (Figure 1). Similarly significant reduction was observed in still birth rate in the 1st(3.2%), 2nd(3.0%) and 3rd(1.9%) as compared to baseline (3.5%) (P=0.001) (Fig.1).As compared to before the start of the intervention (9.1%), there was a significant decline in Perinatal asphyxia in 1st(8.6%), 2nd(4.3%) and 3rd(5.6%) quarter (P <0.001) (Figure 1).

Neonatal mortality rate in neonates admitted in SNCU at baseline was 22.6% which improved to 20.1%, 17.6% and 17.9% in 1st, 2nd and 3rd quarter respectively. This data shows declining trend but did not reach statistical significance (P=0.24) (Fig.2). A total of 1045 patients suffering from birth asphyxia were admitted to the District Hospital in Shrawasti over one year. A total of 317 asphyxia cases were reported before the intervention. As compared to before the start of the intervention (67.7%), there was a significant decline in proportion of neonatal admission with birth asphyxia in SNCU in 1st(72.4%), 2nd(52.1%) and 3rd(42.5%) quarter (P <0.001) (Figure 2).

Qualitative data (Figure-3)

Theme I: From Harmful Habits to Safer Births: Enhanced awareness initiatives have led to a significant reduction in maternal complications, thereby improving the overall patient experience in maternal care. This improvement is particularly notable in the reduction of birth asphyxia and neonatal deaths, indicating a positive shift in neonatal health outcomes. The change in oxytocin administration practices, including the introduction of new protocols and the discontinuation of fraudulent practices, has contributed to a more reliable and safer approach to maternal care. Additionally, there is evidence of improved practice and referrals, fostering a more natural birth experience for mothers while ensuring better healthcare quality.

“Actually, ma'am, initially, we used to administer oxytocin before delivery.”(ANM Malhipur)

“When these methods were used, complications such as asphyxia, maternal deaths, fetal deaths, and neonatal deaths significantly decreased." (SN Sirsiya)

“The improvement is noticeable, with birth asphyxia cases decreasing from 60-65 to 20-25, and neonatal deaths dropping from 22-23 per month to 6-10-11." (SN DCH)

“A lot of fraudulent practices were happening, but now, people don't force us. They don't force us to give a pain-killer injection to their patients. They know it's harmful."(SN Malhipur)

At an administrative level, the implementation of accountability and deterrence measures signifies a pivotal change in ensuring responsible practices and discouraging malpractice.

“If anyone misuses oxytocin, MOIC Sir himself has informed us that strict actions would be taken against them. A couple of staff members have had their duties removed, and they were shifted from labour rooms to ANC, as a form of punishment." (*SN Sirsiya)*

These changes collectively highlight a substantial positive effect on both maternal and neonatal healthcare, emphasizing the importance of evolving practices, heightened awareness, and stringent administrative measures in improving overall healthcare outcomes.

Theme II: Training that Transformed Care: Qualitative analysis of the "Effect of Training" theme and its corresponding codes highlights a significant enhancement in knowledge and awareness among healthcare workers. Following training sessions, there's a notable increase in awareness regarding the role and proper use of oxytocin, empowering ASHA workers, and improving the overall knowledge base among healthcare professionals. This includes a heightened understanding of correct medical procedures and clinical practices, indicating the successful adoption of more appropriate and effective healthcare methods.

“Earlier, the staff didn't have much knowledge. They used to administer oxytocin even before the delivery, without understanding its implications. We motivated and educated our staff. We explained the benefits and risks. We made them aware of the harm in administering oxytocin before childbirth." (SN Gilaula)

"After receiving district-level training, we started following the rules more diligently, and maternal deaths decreased." (ANM Sirsiya)

The introduction of a triage process has significantly improved the efficiency and effectiveness of patient prioritization, reflecting a positive change in the healthcare system's workflow. Moreover, counselling and family education have emerged as crucial components, ensuring patients and their families are well-informed and supported throughout the healthcare journey.

“The new approach involved triage and detailed patient data collection, including FHS (foetal heart sound) monitoring.” (SN DCH)

“The fear of maternal complications and neonatal death significantly decreased with this approach." (SN Ikauna)

The role of stakeholders, such as learning from senior staff, collaboration with partner agencies, and the influence of external agencies, has been instrumental in shaping the training's effect.

“We now provide counselling to patients and their family members. Earlier, they had misconceptions that the moment they reached the hospital, a drip with medication would be started. Now, everyone knows that it is harmful." (SN DCH)

“Partner agencies played a significant role in educating us about complications during deliveries and the correct use of oxytocin.”(SN Gilaula)

The collaborative efforts among different entities signify a holistic approach towards improving healthcare practices, incorporating diverse perspectives and resources to enhance the overall quality of care.

Theme III: Health Workers Finding Their Voice: There's a noticeable shift in staff behaviour attributed to increased awareness among the workforce. This is evidenced by an enhanced understanding of protocols and practices, leading to substantial improvements in staff behaviour

and performance within healthcare settings. Staff motivation and education play a pivotal role in this transformation, fostering a more informed and proactive healthcare workforce. This includes improved adherence to protocols, better utilization of resources, and a more patient-centric approach. The role of ASHA workers emerges as integral, contributing significantly to team dynamics and overall effect. Their involvement in disseminating knowledge and providing support has positively influenced healthcare practices.

"Staff in the labour room started saying that all this (misuse of oxytocin) is happening too much. Gradually, when they saw all these things, they also started noticing."(SN Ikauna)

"Regular meetings, training, and reinforcement of these changes improved our practices. Various agencies and professionals trained our staff."(SN Sirsiya)

The effect is not only limited to individual healthcare workers but extends to the team level, signifying a collective change in behaviour and practice. This collaborative effort among healthcare professionals reflects a more cohesive and efficient approach to patient care.

"Our team made a significant difference. The agency's visits prompted change. We could not have achieved these improvements without them." (SN DCH)

Moreover, there's evidence of a shift towards restricting drug administration practices, indicating a more cautious and regulated approach towards medication usage. This suggests greater emphasis on patient safety and compliance with established guidelines, driven by the effect of training and awareness initiatives among healthcare workers.

"The maternal and newborn care in our area has improved because earlier, the practices were different. We used to administer drugs and procedures without proper understanding. For instance, even when a patient was multi-gravida, we would still use oxytocin, and despite knowing better, we had bad habits. Babies would develop asphyxia, and sometimes even maternal complications were high." (SN Sirsiya)

Theme IV: Families on the Frontline of Change: Resistance to change is observed among some patients and their families, particularly concerning alterations in established healthcare practices. The inclination of some patients towards pain-killer injections, with certain individuals demanding such interventions. It signifies a specific preference among some patients for certain medical interventions, potentially due to a desire for perceived immediate relief.

"Many times, the patient would get a little angry, threaten to run away from the hospital where they'd have their way." (SN Malhipur)

However, there is evidence of a positive effect on awareness among patients and their families. Increased awareness is evident in patients' improved understanding of healthcare processes, leading to positive changes in attitudes. Patients feel more empowered and informed about the importance of proper care, indicating a willingness to actively engage in their healthcare journey.

"Patients are benefiting. They come for deliveries without asking for pain-relieving injections. They know it's harmful, and it's showing results."(SN Ikauna)

"After oxytocin is administered and PPH occurs, we observe that a large amount of blood loss occurs. For the next patient, the family sees that blood loss was less, and they also realize that the previous delivery led to more blood loss."(SN DCH)

"Patients generally felt happier as complications were minimal with this approach, especially among those with higher education."(SN Gilaula)

This dual dynamic showcases the complexity of implementing new practices and the varying responses among individuals when confronted with healthcare alterations.

Theme V: From Missing Notes to Meaningful Records: The monitoring and documentation of the usage of uterotonics increased with training. This improved reporting systems, indicating a higher quality of data collection and analysis. A notable improvement in the quality and thoroughness of documentation practices.

"We started monitoring and reporting complications regularly, holding monthly meetings, and referring cases appropriately."(SN Ikauna)

Furthermore, the analysis highlights a historical issue of inadequate reporting and documentation practices before interventions were implemented. The lack of documentation and monitoring in the past is identified as a significant gap that has been addressed through the interventions introduced.

"Records for administering oxytocin or misoprostol were not maintained before. The records were only maintained after delivery."(SN Gilaula)

"We didn't document the use of oxytocin in patient records."(SN Malhipur)

This acknowledgement suggests a shift from previously insufficient practices towards more comprehensive and reliable documentation and monitoring methods.

Theme VI: The Struggles Before Reform: This characterizes the healthcare landscape before interventions were introduced. Limited resources were a significant challenge, particularly in handling complications related to maternal and neonatal health. The healthcare system faced constraints in adequately managing and addressing complications due to resource scarcity.

"Earlier, we did not have sanitary pads, so we used cloth or homemade pads when there was bleeding. Now that we have sanitary pads, PPH (postpartum haemorrhage) was seen. People would insist on fundal pressure, which means pressing on the abdomen to expedite the delivery."(SN Gilaula)

The status of maternal and neonatal health before interventions showed negative consequences, primarily manifested through complications. Complications arising from childbirth or related issues were relatively common.

"We also administered misoprostol, instructing patients to insert it vaginally to expedite dilation."(ANM Malhipur)

"Neonates often faced complications; they wouldn't cry or express distress."(SN Sirsiya)

"complex cases, we referred patients to the district hospital."(ANM Sirsiya)

Furthermore, the status of the community portrayed a lack of awareness among its members regarding maternal and neonatal health.

Overall, the qualitative findings indicate a challenging healthcare landscape characterized by limited resources, higher instances of complications among mothers and newborns, and a lack of community awareness regarding maternal and neonatal health issues before the implementation of interventions. These issues underscore the critical need for targeted interventions and improvements to enhance the overall healthcare outcomes for mothers and newborns in the community.

Theme VII: Oxytocin Misuse: A Risky Shortcut: It focuses on the difficulties and potential dangers associated with the administration of uterotonic drugs. It highlights the risks involved in using these drugs without adequate training or guidelines, which might lead to complications during labour or childbirth. It addresses the inappropriate or incorrect use of oxytocin, a common uterotonic drug. It encompasses instances such as using oxytocin during the third stage of labour or its misuse, possibly due to a lack of knowledge or adherence to medical procedures.

SN DCH: "The misuse of oxytocin and misoprostol was prevalent. The practice was to induce delivery as quickly as possible, using these drugs to speed up the process."

"Improper use of oxytocin, higher levels of postpartum haemorrhage, and increased complications led to staff revising their practices."(SN DCH)

It was observed that various aspects related to the administration of oxytocin, including the influence of doctors on its usage, changes in administration methods, and patient disclosure and feedback concerning the use of this drug during childbirth.

Figure 1 Trend of the change in maternal and neonatal outcomes based on data from community health centers

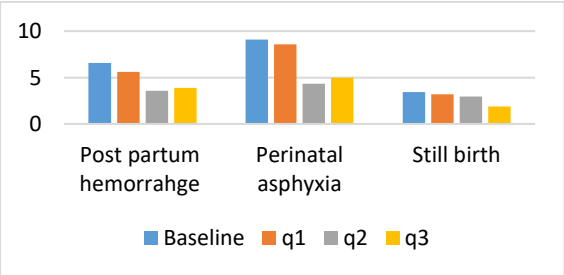
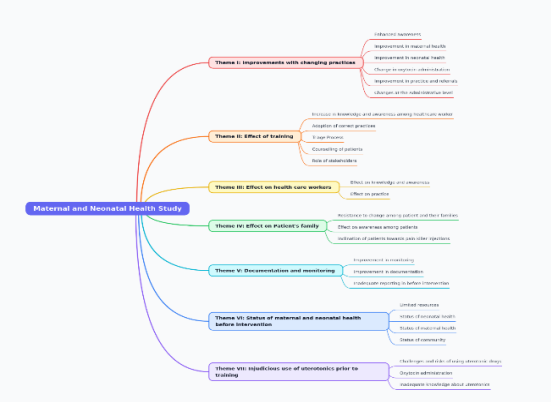


Fig 3. Qualitative Analysis



"Patients sometimes disclosed that they were given injections or pills before delivery. We inquired, and their input was invaluable."(SN Gilaula)

"We identified instances where patients were given injections before delivery, which we didn't know earlier."(SN Ikauna)

The inadequate knowledge and practices related to uterotonic drugs, encompasses assumptions about labour, lack of awareness regarding complications, and insufficient understanding about the appropriate use of these drugs among healthcare providers.

“When we started our jobs, we had no idea about how to conduct deliveries. We used to administer oxytocin, thinking it would induce deliveries. We didn't know the correct dosages or when to administer it. (ANM Malhipur)

"We assumed that when a woman was in pain, it meant she was in labour, and we administered oxytocin."(SN Sirsiya)

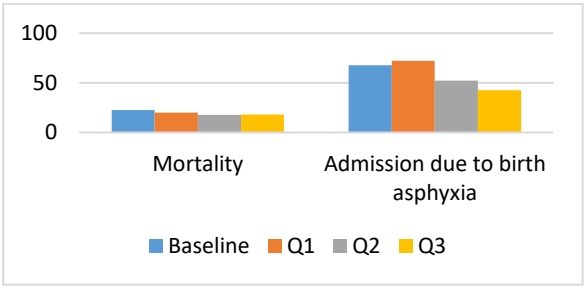
“We were unaware of complications such as postpartum haemorrhage (PPH) and didn't know how to handle them. We thought it was normal for women to experience complications during delivery." (SN Gilaula)

“The improvement is noticeable, with birth asphyxia cases decreasing from 60-65 to 20-25, and neonatal deaths dropping from 22-23 per month to 6-10-11."(SN DCH)

“The change in birthing practices led to a substantial decrease in birth asphyxia and neonatal deaths."(SN Sirsiya)

The observations emphasize the critical need for comprehensive training, guidelines, and awareness programs to ensure the judicious and safe use of these medications, reducing risks and improving maternal health outcomes.

Figure 2 Trend of the change in neonatal mortality and birth asphyxia related admissions based on data from SNCUs



DISCUSSION

This study provides evidence that a set of targeted, context-specific interventions can lead to significant improvements in maternal and neonatal health outcomes in resource-limited settings. The observed reductions in postpartum haemorrhage (PPH), stillbirths, and birth asphyxia admissions in Shrawasti are consistent with national goals under the National Health Mission (NHM) and echo findings from similar health systems strengthening efforts in other aspirational districts and low-resource settings globally.

The reduction in PPH from 6.6% at baseline to 3.9% in the final quarter of the intervention period is particularly

notable. Studies have shown that active management of the third stage of labor (AMTSL), including the judicious use of uterotonics, is critical in preventing PPH (15). Our findings support this, especially in light of qualitative evidence revealing improved clinical practice among staff nurses and ANMs post-intervention. The trend aligns with a study by Weeks et al. (2007), which emphasized the global burden of PPH and the role of standardized oxytocin protocols in reducing maternal mortality (16). Furthermore, a multicentric evaluation in India reported a PPH prevalence of approximately 6–8%, comparable to our pre-intervention baseline (17). The post-intervention reduction to <4% thus reflects a substantial improvement.

Similarly, stillbirth rates declined from 3.5% to 1.9%, significantly outperforming the national average of 3.0% reported by the Sample Registration System (SRS) for 2019 (18). This decline may be attributed to timely intrapartum management, reduced oxytocin misuse, and better monitoring during labor—areas highlighted in other Indian studies as key modifiable risk factors for stillbirth ($_{19\text{-}20}$). Moreover, this trend resonates with findings from interventions in Bangladesh and Nepal, where strengthening facility-based deliveries and skilled birth attendance led to a measurable drop in stillbirth rates (21).

Neonatal outcomes demonstrated a mixed pattern. While the neonatal mortality rate (NMR) among admitted neonates declined from 22.6% to 17.9%, the change was not statistically significant (P = 0.24). Nevertheless, this pattern is encouraging, especially considering the complexity of neonatal care and pre-admission variables like delayed referrals and suboptimal home-to-facility transitions. According to the SRS, the national NMR was 20 per 1,000 live births in 2020 (22), and recent facility-based studies have reported mortality rates as high as 25–30% in SNCU-admitted neonates in similar tier-2 districts, supporting the relative progress achieved in Shrawasti (23).

The most compelling neonatal finding was the significant reduction in birth asphyxia admissions—from 67.7% at baseline to 42.5% in the final quarter (P < 0.001). This is congruent with WHO data indicating that timely, skilled intrapartum care can prevent up to 30% of intrapartum-related neonatal deaths (24). In India, studies from tertiary care centers have found that asphyxia contributes to 20–40% of early neonatal deaths (25). The interventions in Shrawasti, particularly those targeting the rational use of oxytocin and reinforcing shift-change monitoring, appear to have directly influenced these rates.

The qualitative data corroborate these improvements, highlighting better adherence to clinical protocols, improved communication and documentation practices, and greater vigilance during high-risk periods (e.g., shift transitions). These findings are in alignment with behavior change frameworks in healthcare, such as the COM-B model, which emphasize capability, opportunity, and motivation as key drivers of behavioral change (26).

A significant enabler in Shrawasti's success was the integration of administrative leadership in health system interventions—a model mirrored in the Aspirational District Programme. This cross-sectoral convergence, as reported in a NITI Aayog evaluation, is associated with faster improvement in health and nutrition indices (27). The role of district leadership in ensuring accountability and resource optimization, as observed in this study, supports the broader literature advocating decentralized, context-sensitive governance in public health (28).

The qualitative findings unearth several themes that elucidate the multifaceted transformation in healthcare practices and its effect. "Improvements with Changing Practices" showcases the positive shift resulting from enhanced awareness initiatives and revised oxytocin administration practices. This change has significantly reduced complications, leading to a more natural birth experience while ensuring better healthcare quality. Moreover, the implementation of accountability measures at an administrative level highlights a shift towards responsible practices, deterring malpractice. Furthermore, themes like "Injudicious Use of Uterotonics before Training" and "Status of Maternal and Neonatal Health Before Intervention" underscore the challenges faced due to limited resources, inadequate awareness, and improper use of medications; before the training was conducted. These findings reinforce the critical necessity for targeted interventions and improvements to enhance healthcare outcomes in the community.

A growing body of literature has established the adverse effects associated with the intrapartum use of oxytocin in obstetric practice. These effects include hyperstimulation, uterine rupture, perineal tears, and fetal distress (15–17). The studies from several districts of rural areas of Uttar Pradesh focuses on the prevalence of home births in rural areas of Uttar Pradesh, India, where untrained practitioners administer oxytocin injections to hasten labour without proper monitoring or medical supervision.(18–20) Thus, establishing protocols for oxytocin use in obstetrics is very essential.

A study conducted in rural Karnataka between 2007 and 2009 revealed that oxytocin was being misused for labour augmentation. The study enrolled 642 pregnant women, with 501 deliveries occurring in healthcare institutions and 99 at home. The findings suggest that oxytocin is being overused in both government and private healthcare settings, highlighting the necessity for adherence to clinical protocols and guidelines to ensure safe motherhood.21 The study complements the comprehensive study on maternal and neonatal health in Shrawasti district, which resulted in significant reductions in adverse outcomes like stillbirths, asphyxia, and post-partum haemorrhage through enhanced awareness initiatives, revised administration practices of oxytocin, and accountability measures at administrative levels.

A retrospective study revealed a considerable incidence of labour dystocia (LD), especially among primiparas, and highlighted associations between oxytocin use, LD, and delivery outcomes. An observational analysis of 1,263 electronic antenatal and delivery records randomly selected from the NU Hospital Group register in western Sweden evaluated the factors associated with LD among 5,702 deliveries between 2000 to 2001. Oxytocin was used in 55% of deliveries, primarily in primiparas (72.8%). Also, the frequency of Caesarean section (CS) was higher among women treated with oxytocin compared to those not given oxytocin, especially in primiparas. Neonates in

the oxytocin group had a higher incidence of acidemia compared to those not in the oxytocin group (22).

The theme "Effect of Training" emphasizes the significant enhancement in knowledge and awareness among healthcare workers, leading to better understanding and adherence to correct medical procedures. The introduction of triage processes, counselling, and family education have all contributed to improved healthcare practices. Similarly, a study was conducted in India to assess the practices and barriers faced by healthcare providers while providing maternal and newborn healthcare. The study collected quantitative and qualitative data from 56 facilities and 125 healthcare providers. The results showed that uterotonics were often used to augment labor, even in facilities not equipped for certain procedures. Primary barriers included a lack of awareness of guidelines, inadequate training, and reliance on traditional practices. The study highlighted the need for comprehensive training, improved guideline awareness, regular supervision, and addressing traditional practices to enhance the quality of maternal and newborn healthcare in India (23).

In corroboration with the above-mentioned studies, the study conducted in Karnataka highlighted the need for standardized guidelines, enhanced training, and improved community education to ensure the safe and appropriate utilization of uterotonics during labour and delivery. The study examined uterotonic use during childbirth in two districts of Karnataka: Bagalkot and Hassan. Formal healthcare providers used oxytocin primarily to augment labour and prevent postpartum hemorrhage (PPH), while informal practitioners commonly administered oxytocin to enhance labour in community settings. Decision-making regarding uterotonic use varied. Family members believed uterotonic injections were used to increase pain and expedite delivery, pressuring healthcare providers to administer these medications (24).

The effect extends to healthcare workers themselves, with a noticeable shift in behaviour and performance, indicating a more informed and proactive workforce. Additionally, the theme "Effect on Patient's Family" portrays varying responses among patients and their families, showcasing an increased awareness and willingness to engage in healthcare decisions. However, challenges persist, including resistance to change among some patients, which underscores the importance of continuous education and community engagement.

A study conducted as part of the Oxytocin Initiative Project investigated the use of uterotonic medications during childbirth in Uttar Pradesh and Karnataka, India. The research included 140 interviews with healthcare providers and mothers. The study found that uterotonic use for labour augmentation was common in both health facilities and community settings, which deviated from established guidelines. The lack of knowledge among community members regarding the adverse effects of incorrect uterotonic use was evident. ANMs associated uterotonic use with risks of prolonged labour and fetal health, sometimes using it without proper indications. Financial pressures were also influential, with some providers admitting to administering uterotonics to ensure monetary compensation.

The current qualitative analysis also addresses the historical issues of inadequate documentation and monitoring practices, highlighting the need for improved reporting systems and comprehensive documentation to ensure a higher quality of data collection and analysis. It is emphasized that the training not only improved clinical outcomes but also addressed systemic issues such as documentation deficiencies, inadequate training, and the inappropriate use of medications. The shift towards more informed, accountable, and patient-centric practices emphasizes the success of the interventions in shaping a more effective healthcare system.

CONCLUSION

In conclusion, the interventions have shown promising results in improving maternal and neonatal health outcomes in the Shrawasti district. The findings emphasize relationship between misuse of oxytocin and birth asphyxia, PPH, still birth, newborn deaths in health facilities. Lack of knowledge and awareness in service providers and care seekers are major road blockers in addressing this issue. Assessment of the financial burden on families and society because of this negligence and ignorance need to be done by district and disseminate the information as one of tool to create awareness in society. Joint efforts of administration and health department in a drive form can address this issue to great extent in which measures like capacity building and sensitization of care providers, awareness of care seekers, rigorous monitoring and prompt referral can be included.

RECOMMENDATION

This study has important public health relevance as it highlights effective, low-cost interventions to improve maternal and neonatal outcomes in resource-limited settings. By addressing modifiable factors such as misuse of oxytocin, inadequate training, and poor documentation, it demonstrates measurable reductions in postpartum hemorrhage, stillbirths, and birth asphyxia. The findings emphasize the role of capacity building, behaviour change, and administrative accountability in strengthening healthcare delivery. Conducted in an aspirational district, the study provides scalable and context-specific strategies that can be replicated in similar high-burden areas, contributing to national priorities and progress toward Sustainable Development Goals for maternal and child health.

LIMITATION OF THE STUDY

Despite the promising results, the study has several limitations. Being a retrospective observational study, it is susceptible to confounding and does not permit causal inference. The lack of a control district or randomization limits generalizability. Seasonal variation and concurrent health programs may have influenced trends. Furthermore, the reliance on facility-based data may not capture community-level determinants or out-of-facility maternal and neonatal deaths. The qualitative findings, though valuable, stem from a limited sample and may not fully reflect all stakeholder perspectives.

Implications and Future Directions: These findings underscore the effectiveness of targeted interventions—particularly those focused on clinical quality, oxytocin use, staff training, and data accountability—in improving key maternal and neonatal outcomes. The results are highly relevant to other aspirational and high-burden districts. Future studies should include a prospective or quasi-experimental design, cost-effectiveness analysis, and community-level data integration to validate and expand upon these insights. Additionally, there is a need to address barriers to neonatal referral compliance and improve early postnatal care to sustain reductions in neonatal mortality.

Relevance of the Study

This study adds evidence that integrated, district-level interventions combining clinical training, rational oxytocin use, administrative accountability, and improved documentation can significantly reduce maternal and neonatal complications. It provides real-world, scalable insights from an aspirational district, highlighting how health system strengthening and behaviour change together improve outcomes in resource-limited settings.

Authors Contribution

All authors have contributed equally.

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Nil

Conflict of Interest

There are no conflicts of interest.

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Declaration of Generative AI and AI Assisted Technologies in the Writing Process

The authors have used generative AI/AI assisted technologies in the writing process.

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