Implementing midwifery services in public tertiary medical college hospitals in Bangladesh: A longitudinal study

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\textbf{ABSTRACT}

\textbf{Background:} A necessary precursor for quality maternity care provision is high quality education. The quality of care that students are exposed to during clinical education on maternity wards shapes their competencies and professional identities. In this study, we look at the introduction of midwives educated to international standards – with facility mentorship – deployed in tertiary level teaching hospitals in Bangladesh with the intention of improving the use of World Health Organization (WHO)-recommended birth practices.

\textbf{Aim:} To examine the outcomes of introducing midwifery services into tertiary level care facilities in Bangladesh, on the use of WHO-recommended birth practices.

\textbf{Methods:} A retrospective review of patient register data was carried out to understand level of changes in use of WHO-recommended birth practices after the introduction of a midwifery service. Multivariate linear regression was applied using an interrupted time series analysis, with and without a delayed effect, to assess both level and trend change following the introduction of the midwifery service.

\textbf{Findings:} A significant increase (p < 0.001) in use of WHO-recommended birth practices was found, both immediately following the midwives’ introduction and after one year. Quality improvement was observed not only in births attended by midwives, but also in those attended by doctors and nurses.

\textbf{Conclusion:} By introducing quality maternity care provision through midwives in clinical sites, especially in tertiary-level care hospitals with large numbers of students, international standard midwives can improve the quality of clinical education in maternity wards, a critical priority for maternal health worldwide.

\textbf{Statement of significance}

\textbf{Problem or issue}
Poor quality maternity care is common in low- and middle-income countries including in tertiary-level care hospitals. This is one of the major challenges to reducing maternal morbidity and mortality and is linked to quality limitations in medical education programs.

\textbf{What is already known}
Midwifery services with midwives educated to International Confederation of Midwives standards can improve care quality.

\textbf{What this paper adds}
Improved care quality at clinical education sites, especially at tertiary-level care hospitals, can improve maternity care education for midwife, medical and nursing students.

\textbf{Abbreviations:} SDG, Sustainable Development Goals; ICM, International Confederation of Midwives; LMIC, low-middle-income countries; QMNC, Quality Maternal and Newborn Care framework; WHO, World Health Organization.

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1. Introduction

Maternity care of insufficient quality remains a global challenge and is a greater barrier to reducing mortality than access to care [1]. Evidence from low- and middle-income countries (LMICs) points to gaps in maternity care among providers being linked to limited exposure to quality clinical practice during their education [2,3]. Education programs not aligned to international standards have prevented both midwives and other care providers (e.g., doctors, nurses etc.) from fully gaining the clinical competency [4] required to deliver high-quality maternity care in line with World Health Organization (WHO) guidelines [5,6].

Midwives educated to standards set by the International Confederation of Midwives (ICM), who are integrated into health systems, and are working in an enabling environment could avert 41% of maternal deaths, 39% of neonatal deaths, and 26% of stillbirths. Evidence shows that care providers who do not have the full scope of midwifery competencies cannot provide the quality care or save the lives that international-standard midwives do [7]. Well-educated midwives are thus the gold standard for providing high-quality maternity care [8,9]. In this vein, the movement toward improved quality supports replacing maternity care providers not meeting an international midwifery standard in LMICs with a midwife [2]. This is especially important in settings where the cost- and life-saving benefits of care provision by midwives meet acute needs.

To improve the quality of maternity care, and in turn have a positive influence on the Sustainable Development Goals (SDGs) 3 on health and 5 on gender [3], WHO recommends practices such as: mobility during labor, upright birth positioning, delayed umbilical cord clamping, and one hour of skin-to-skin contact between mother and newborn immediately after birth. The guidelines also recommend against certain practices, namely routine use of episiotomies and routine use of oxytocin to augment the labor process, and the widely used harmful practice of routine manual exploration of the uterus in the immediate post-partum period [5,6].

In Bangladesh, the process of educating 3-year diploma level midwives according to international standards has been ongoing since 2013 [10]. Since 2016, licensed midwives have been placed in sub-district level health facilities replacing existing nurse midwives [11]. Data thus far indicate improved quality maternity care resulting from their deployment, though competency gaps remain [12]. This paper looks at a midwifery service that was initiated in maternity wards of two of the largest tertiary-level care teaching hospitals in Dhaka in August 2019. The overall goal was to improve the quality of clinical care, and clinical education through increasing the use of WHO-recommended birth practices; and the promotion of normal physiological childbirth [5,6]. In total, 14 midwives were deployed, six and eight respectively. Midwives were assigned to provide the direct care for labor, birth, and the immediate and post-partum and newborn period as part of an interdisciplinary team including doctors and nurses.

One mentor, who was a medical doctor employed by the Obstetrical and Gynecological Society of Bangladesh (OGSB), was placed full time at each site. The mentors received regular coaching from an international midwifery specialist employed by the United Nations Population Fund (UNFPA). The mentors worked to establish a supportive relationship with the maternity ward department heads. This was needed to counter the common phenomenon of resistance from doctors and nurses to the midwives and the new birth practices. The department heads encouraged acceptance of the midwives among the other maternity ward managers, staff and student interns who were largely unfamiliar with midwifery and many of the new birth practices. Mentors educated the maternity staff regarding midwives’ scope of practice and the new skills.

Mentors also provided regular on-the-spot feedback and education to all maternity staff regarding midwives’ scope of practice and the new skills. Mentors also provided regular on-the-spot feedback and education to all maternity staff regarding midwives’ scope of practice and the new skills.

2. Methods

This study was part of a larger project in Bangladesh funded by the Swedish International Development Cooperation Agency with the ID 52170012, aimed at introducing an international standard midwifery service into two tertiary level care teaching hospitals in Dhaka, Bangladesh using the WHO-recommended birth practices [5,6]. Ethical clearance was obtained from the Ministry of Health and Family Welfare. A longitudinal research design was used [13] and data were collected through maternity ward registration records.

2.1. Study setting

Bangladesh has made significant progress in improving maternal health, yet, in the last 10 years, maternal mortality appears to have largely stalled at 196/100,000 live births, and is far from the national goal of 105/100,000 by 2022 [14]. Tertiary level care teaching hospitals in Bangladesh provide the highest acuity of care nationally. Both hospitals in this study serve over 1000 pregnant women monthly. Both hospitals had large numbers of maternity staff with approximately 100 doctors and 42 nurses. Every three months, 70 medical students, 50 midwifery students and 30 nursing students rotate through each maternity ward. The hospitals are also clinical sites for obstetrician-gynecologist interns and residents. Between these two hospitals, around 1200 medical, care provider students are taught annually.

2.2. Midwifery service intervention

The midwifery service was initiated at the two teaching hospitals in Dhaka in August 2019. The overall goal was to improve the quality of clinical care, and clinical education through increasing the use of WHO-recommended birth practices; and the promotion of normal physiological childbirth [5,6]. In total, 14 midwives were deployed, six and eight respectively. Midwives were assigned to provide the direct care for labor, birth, and the immediate and post-partum and newborn period as part of an interdisciplinary team including doctors and nurses.

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2.3. Data collection

Retrospective data on routine childbirth care were collected from each hospital by the mentors. Data comprised variables on the WHO-recommended birth practices: non-supine labor, non-supine birth, skin-to-skin contact, delayed cord clamping, avoidance of routine episiotomy, avoidance of routine oxytocin augmentation, and avoidance of routine manual exploration of uterus after birth, were collected with standardized Excel forms. Mentors consolidated data from patient records, anonymized and shared monthly as part of the routine reporting. Data from all births for the period January 2019 to May 2021 were extracted from the project forms, covering seven months prior and 21 months after the intervention. Only seven months of data from before the intervention were collected as the project did not gather hospital data prior to this. Twenty-one months of post-intervention data were collected to accommodate a significant service disruption caused by the COVID pandemic.
2.4. Data analysis

Descriptive analysis was used to observe change over time following the intervention. The WHO-recommended birth practices were the outcomes of interest. An interrupted time series analysis with segmented multi-variate regression was also used with the lme4 package in R statistical language [13]. Due to COVID-19 pandemic related disruption on services and irregularities caused by a staff transition, two versions of the interrupted time series model were employed. The first model explored the immediate effect of the intervention while the second model considered a delayed effect after one year. Significance was determined using a 0.05 threshold.

3. Results

Across both hospitals, there were a total of 40,182 births; 18,277 (45 %) were vaginal births, of which 6965 (38 %) were attended by midwives. The proportion of vaginal births attended by midwives increased from 0 % prior to the initiation of the intervention to 86 % at the end of the intervention. Its highest level was 95%, six months after the onset of COVID-19. Fig. 1 depicts the trend line of vaginal births by midwives against all vaginal births. However, an overall trend of decline in total numbers of vaginal births is observed, largely paralleling the onset and progression of the COVID-19 pandemic. At the same time, the onset of the pandemic marks a conversion point where midwives began attending upwards of 85 % of all vaginal births. Prior to the pandemic, the new midwives were attending fewer than 30 % of vaginal births, with other maternity staff and interns attending all other vaginal births and cesarean sections. Cesarean sections comprised 43–62 % of all births across the 28 months of data.

Table 1 displays the change over time of the employment of each birth care practice. Across four of the variables—non-supine labor, no episiotomy, no oxytocin augmentation, and no manual exploration of the uterus—a pattern was observed in which use of evidence-based birth practices increased slightly following the introduction of midwives and then more dramatically after the onset of COVID-19. Non-supine labor, skin-to-skin contact, and delayed cord clamping had a slightly different pattern. All three of these practices increased significantly immediately following the introduction of midwives and then somewhat more gradually after the pandemic was in full swing.

The multivariate tests indicate that, overall, there was a significant effect of midwives on use of evidence-based birth practices both immediately and over time after their introduction. Table 2 shows the model applied against the full time-series data. Table 3 shows the model applying a delayed effect, comparing the trend before midwives were introduced to the trend one year following their introduction. Due to a staff transition in one of the hospitals during this time, evidence-based practice use declined between the months of January and April 2020. This is seen in Table 1 and Table 2. The delayed-effect regression model was selected to account for the transitional period after the introduction of midwives by comparing evidence-based practice use before the intervention and one year after.

The coefficients for each outcome variable in the model were also examined for significance. Using all data (Table 4), the model showed a significant level change after the introduction of midwives for non-supine birth, skin-to-skin, and delayed cord clamping. The delayed-effect model (Table 5) showed a significant level change one year after the introduction of midwives, but no change in trend, as the lines’ slopes were similar pre-intervention and one year post intervention (see Fig. 2).

4. Discussion

We examined the effectiveness of establishing a midwifery service with facility mentorship in two tertiary care teaching hospitals in Bangladesh to improve care quality and thus clinical education. An overall increase in evidence-based care was found immediately following the introduction of midwives, despite ½ of births still being attended by doctors or nurses. The results show three of the seven practices increased significantly immediately following the introduction of midwives. This occurred despite some resistance from doctors and nurses to the midwives and the new birth practices. After one year, when midwives were attending upwards of 85% of births, use of all seven evidence-based practices was significantly greater than the period prior to the midwives’ introduction. It is thus evident that midwives with the support of facility mentors can meaningfully improve the quality of maternity care within a short period of time (i.e., <3 months) in a teaching hospital, in a lower resource setting.

It was an encouraging finding that the increase in use of WHO-recommended birth practices occurred not just among births attended by midwives but also among births attended by nurses and doctors supported by midwife, medical and nursing students on clinical rotations. This demonstrates that placement of midwives in a teaching hospital setting can lead to adoption of WHO-recommended birth practices by existing clinicians as well as students. Notably, as described in other literature [16], mentors’ work to establish commitment for midwifery care paved the way for midwives to lead and role model midwifery service provision. We view this as a critical finding, as to our knowledge, maternity care quality in clinical practice settings has only lightly been touched upon in clinical education literature, despite that WHO recommendations [17] and ICM competencies [18] describe its importance. We therefore highlight here that exposure to quality care, and skill transfer from midwives, may improve the quality of education for all students on the maternity ward—including midwife, medical and nursing students—and thus impact their service provision after graduation.

Quality clinical practice experience is formative for students’ use of evidence-based practices, critical thinking and ethical decision-making [19–21]. Yet, there are well-documented weaknesses in clinical teaching for students of medicine in both low- and high-resource settings [22–24]. Gaps are common between the theories learned in classrooms and the practices students are exposed to in clinical sites [25]. Supervision in clinical sites may not be carried out by clinicians willing and able to perform a teaching role, and competency-based education may not be well-understood, nor is its assessment standardized [25–27]. In addition to the teaching pedagogy, the quality of care that students observe and practice during clinical practice also impacts their learning. In this study, midwives not been present to model and guide care according to WHO standards [5,6], sub-standard care would have been modeled to midwife, medical and nursing students. Inevitably, if students are primarily exposed to poor quality maternity care, this will impact their future practice.

Fig. 1. Number of vaginal births attended by midwives against total vaginal births during Jan 2019-May 2021.
Poor quality maternity care is common in LMIC health systems, including at tertiary care teaching hospitals [28–30]. However, the literature on clinical education gives little attention to the quality of clinical care that students are exposed to. This may be at least partially due to an assumption—perhaps optimistic—among researchers of a basic quality standard at clinical sites. In 2019, WHO called for an enhanced focus on quality midwifery education, outlining a seven-step framework for action [31]. Step 4 relates to preparation of educational institutions, practice settings and clinical mentors, and identifies the need for ensuring that Renfrew et al.’s (2014) Quality Maternal and Newborn Care (QMNC) framework [8] is understood and implemented in clinical practice settings. The QNMC makes reference to the importance of evidence-based maternity care, however, the actions required to do this are not elaborated on. We observe this to be a larger challenge than is acknowledged in the literature and urge deeper consideration for how midwifery education programs can ensure quality care in practice settings. Our findings lead us to suggest that the quality of the clinical care at practice sites, especially in teaching hospitals, be an essential component for assessing clinical education quality, and thus overall education, in global guidelines. Education institutions and practice settings need stronger support to utilize WHO-recommended clinical practices, and educators need to prioritize student exposure to quality care. This could be achieved through introducing midwifery services to maternity wards with midwives educated to ICM standards to establish evidence-based care at clinical sites. This study comes at an important time when the need for well-educated midwives in LMICs has never been clearer. The scope of midwifery depicted in the QMNC framework [8] encompasses 85% of all maternal and newborn health services. The reality of the human resources challenge in LMICs means that maternity care is often provided by doctors, nurses, midwives, and auxiliary providers whose education was not aligned with ICM standards for evidence-based maternity care. We thus echo the call for greater investment in internationally standard midwifery education, and with it improved clinical care quality at teaching sites, to advance quality improvement in maternal and newborn health care in LMICs [31,32]. Hence, more investments are needed at all levels of implementation.

4.1. Strengths and limitations

This study provides insight into introducing standard midwifery services into two tertiary level care teaching hospitals in Bangladesh, previously deploying nurses and doctors to provide maternity care. As such it makes an important contribution to the limited evidence-base

**Table 1**

<table>
<thead>
<tr>
<th>Dependent variable</th>
<th>Non-supine labor</th>
<th>Non-supine delivery</th>
<th>No episiotomy</th>
<th>No oxytocin</th>
<th>No manual exploration of uterus</th>
<th>Skin-to-skin contact</th>
<th>Delayed cord clamping</th>
</tr>
</thead>
<tbody>
<tr>
<td>(Intercept)</td>
<td>0.136</td>
<td>0.016</td>
<td>0.482 **</td>
<td>0.343</td>
<td>0.205</td>
<td>0.452 **</td>
<td>0.028</td>
</tr>
<tr>
<td>Time</td>
<td>0.002 *</td>
<td>-0.0001</td>
<td>-0.008</td>
<td>-0.003</td>
<td>0.001</td>
<td>-0.019</td>
<td>0.001</td>
</tr>
<tr>
<td>Midwives_level</td>
<td>0.323 **</td>
<td>-0.108</td>
<td>0.031</td>
<td>-0.170</td>
<td>0.013</td>
<td>0.319 **</td>
<td>0.540 **</td>
</tr>
<tr>
<td>Midwives_trend</td>
<td>0.029</td>
<td>0.062 *</td>
<td>0.039 *</td>
<td>0.051</td>
<td>0.044</td>
<td>0.035 **</td>
<td>0.018</td>
</tr>
<tr>
<td>Adjusted R²</td>
<td>0.849</td>
<td>0.873</td>
<td>0.781</td>
<td>0.639</td>
<td>0.727</td>
<td>0.902</td>
<td>0.955</td>
</tr>
<tr>
<td>F Statistic (df = 3; 25)</td>
<td>53.634 **</td>
<td>64.343 **</td>
<td>34.332 **</td>
<td>17.457 **</td>
<td>25.842 **</td>
<td>86.838 **</td>
<td>197.123 **</td>
</tr>
</tbody>
</table>

*p < 0.05, * *p < 0.01, * * *p < 0.001.

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**Table 2**

Segmented multivariate test (all months).

<table>
<thead>
<tr>
<th></th>
<th>F-test (approx.)</th>
<th>num DF¹</th>
<th>den DF</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Time</td>
<td>2.9920</td>
<td>7</td>
<td>19</td>
<td>0.031</td>
</tr>
<tr>
<td>Midwives_level</td>
<td>25.1239</td>
<td>7</td>
<td>19</td>
<td>&lt; 0.001</td>
</tr>
<tr>
<td>Midwives_trend</td>
<td>4.6783</td>
<td>7</td>
<td>19</td>
<td>0.003</td>
</tr>
</tbody>
</table>

¹ DF = degrees of freedom

**Table 3**

Segmented delayed-effect multivariate test (before and one year after).

<table>
<thead>
<tr>
<th></th>
<th>F-test (approx.)</th>
<th>num DF²</th>
<th>den DF</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Time</td>
<td>3.49</td>
<td>7</td>
<td>7</td>
<td>0.061</td>
</tr>
<tr>
<td>Delayed_level</td>
<td>744.90</td>
<td>7</td>
<td>7</td>
<td>&lt; 0.001</td>
</tr>
<tr>
<td>Delayed_trend</td>
<td>1.73</td>
<td>7</td>
<td>7</td>
<td>0.243</td>
</tr>
</tbody>
</table>

² DF = degrees of freedom

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around effects of such services in LMIC health systems. It is possible, however, that inaccuracies in the hospital datasets were not identified, despite rigorous attempts to review and double-check records for accuracy. While the pandemic did not affect data collection, it led to a significant disruption in services, as well as significant decreases in patients receiving care. The disruption caused by the pandemic created both noise in the data (which led to the addition of the interrupted time series model) and an opportunity for midwives to lead care provision without many of the usual barriers to an enabling environment.

5. Conclusion

This study provides evidence from Bangladesh that the introduction of international standard midwives, and mentors who champion midwifery, can lead to improved care quality for patients, including from nurses and doctors. Doing so in a maternity ward at a tertiary care teaching hospital may also catalyze diffusion within other health facilities following residents’ deployment.

Our findings point to the importance of quality clinical practice in teaching settings for the strengthening of maternity care provider education globally. Investments in quality clinical practice exposure should be elevated within programs investing in strengthening midwifery education, as well as in maternal and newborn health education for all maternity care providers. We suggest that future research examine whether the positive outcomes achieved in this study are sustained over time.

Ethical statement

This study was part of a larger project in Bangladesh approved by the Ministry of Health and Family Welfare and funded by the Swedish International Development Cooperation Agency with the ID 52170012.

Declaration of Competing Interest

The authors declare that they have no conflict of interest. The authors alone are responsible for the views expressed in this publication, which do not necessarily represent the decisions or policies of the funder.
References


