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The maternity dashboard is an effective tool for the improvement of maternal and neonatal care outcomes: a prospective observational study from Iraq

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ABSTRACT

Background: The implementation of maternal dashboards in hospitals is both feasible and effective in improving healthcare quality. The dashboards provide rapid feedback on local outcomes in an accessible format and enable early detection of potential problems. They serve as a simple computerized tool that graphically presents the health facility's clinical data, utilizing a traffic-light coding system so as to alert front-line staff about changes in the frequency of clinical outcomes. *Aim:* The aim of this study was to assess the effectiveness of the maternity dashboard in improving maternal health, reducing Neonatal Intensive Care Unit (NICU) admissions, as well as enhancing maternal and neonatal outcomes in an Iraqi hospital. *Methodology:* Data were collected over one year, from January 1st to December 30th, 2023. A prospective observational study (hospital-based record review) was conducted at the Obstetrics and Gynaecology Teaching Hospital in Kerbala, Iraq. Data were obtained from the medical records of all patients admitted to the obstetrical ward for labor, delivery, and the postpartum period during 2023. The maternal dashboard, a traffic light program (green, amber, red), was used in order to monitor outcomes. Data were collected manually from the outpatient department, the labor ward, the NICU registers, and the electronic records by using Excel. *Results:* A total of 136,519 women (who were either pregnant, in labor, or postpartum for up to 42 days) were admitted to the Obstetrics and Gynaecology Teaching Hospital in Kerbala during the study period, with 18,791 of them delivering. The implementation of the maternity dashboard resulted in significant changes: the normal vaginal delivery rate increased from 66% to 68% (p=0.0024), the caesarean section rate decreased from 33% to 31% (p=0.0001), the stillbirth monthly cases declined from 16±5 to 12±3 (p<0.05), the NICU admission monthly instances decreased from 96±14 to 71±17 (p<0.05), and early neonatal death monthly cases were reduced from 12±5 to 9±3 (p<0.05). *Conclusion:* The study results show that maternity dashboards are vital instruments for monitoring and improving the quality of maternity care. They effectively enhance maternal and neonatal care quality indicators when comparing results before and after their implementation.

KEYWORDS

maternity dashboard, quality indicators, caesarean section, neonatal intensive care, stillbirth

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1. INTRODUCTION

Enhancing the quality of care and clinical outcomes for women remains a critical responsibility and focus for healthcare institutions [1,2]. Optimal care is essential during pregnancy, labor, and the early neonatal period. The level of care provided during these phases directly impacts the well-being of both the mother and the infant [3]. Favorable maternal and neonatal outcomes are primarily the result of timely, appropriate, and high-quality care provided by skilled prenatal healthcare providers [4]. Improving the quality of care for pregnant women and newborns is crucial for ensuring positive health outcomes and reducing maternal and infant mortality rates [5,6]. Assessing healthcare quality is one of the key steps in improving care for expectant mothers and newborns [7].

The London-based Royal College of Obstetricians and Gynaecologists has recommended the use of a maternity dashboard (MDB) in order to optimize clinical care and to continuously monitor clinical outcomes in pregnant women. The MDB assists in identifying and managing suboptimal clinical practices [8,9], and plays a significant role in the accurate and continuous monitoring of performance, thereby facilitating necessary adjustments to services and enhancing patient care [10]. The primary goal of the MDB is to ensure the integration and perpetuation of clinical governance principles in the daily operations of healthcare professionals [11]. Clinical governance is a structured framework within which healthcare institutions must continuously improve care quality and achieve superior patient care standards while maintaining high levels of care. Managers may benefit from the MDB, as it enables informed decision-making, serving as a powerful tool for gauging the variance between real-time performance and predetermined objectives. Consequently, it becomes imperative to introduce modifications aimed at improving the efficiency of hospital healthcare operations [1,10,12]. The MDB provides a monthly summary of performance in gynecology and obstetrics wards concerning established quality indicators (QIs), making it invaluable [13,14]. Through a color-coded system (red, amber, and green), the dashboard effectively illustrates deviations in performance and QIs, thereby enabling a comprehensive understanding of service quality and performance for users [10,14,15]. Therefore, the MDB emerges as a powerful and dynamic mechanism for quality assurance, continuous service improvement, and performance oversight [8,10,16]. This study aimed at investigating the effectiveness of the MDB in reducing admissions to the Neonatal Intensive Care Unit (NICU), as well as in improving maternal and neonatal outcomes in an Iraqi hospital.

2. METHODOLOGY

2.1. Study details and data collection

Data were collected over one year, from January 1st to December 30th, 2023. A prospective observational study (hospital-based record review) was conducted at the Obstetrics and Gynaecology Teaching Hospital in Kerbala, Iraq. Data were obtained from the medical records of all patients admitted to the obstetrical ward for labor, delivery, and the postpartum period during 2023, with additional data collected from the preceding year. The study included 18,791 deliveries and live births weighing ≥500 g in 2023. Several indicators, such as normal vaginal delivery (NVD), the performance of a caesarean section (CS), stillbirth cases, and NICU admissions, were recorded. Data were collected manually from the outpatient department, the labor ward, the NICU registers, and the electronic records. A user-friendly MDB was created by using Microsoft Excel 2016. The dashboard was displayed in the delivery suite for monthly review by the frontline staff. It included indicators, international benchmarks, and locally-set goals. The upper and lower limits for each parameter were determined by the MDB team. A traffic light color-coded system was used so as to provide immediate visual feedback. “Green” indicated that the goals were met, “yellow” indicated the goals were unmet, and “red” indicated the upper threshold was breached. The traffic light approach graded performance, with green parameters considered the gold standard, and yellow and red parameters depicting areas requiring immediate corrective measures. All analysed parameters were noted on the MDB, as shown in Table 1.

2.2. Ethical approval

Official approval for conducting the study was obtained from the College of Medicine and the Postgraduate Studies Committee of the Al-Mustansiriyah University. Additionally, measures were implemented in order to ensure patient confidentiality and adherence to ethical guidelines throughout the study.

2.3. Statistical analysis

Data analysis was conducted by using Microsoft Excel 2016.

Table 1. The maternal dashboard (MDB) of our study (during 2023) considered all activities related to mothers and their neonates. Abbreviations used: CS, caesarean section; END, early neonatal death; ICU, intensive care unit; NICU, neonatal intensive care unit; NVD, normal vaginal delivery; OPD, outpatients and day (patients); PPH, postpartum haemorrhage; RCOG: Royal College of Obstetrics and Gynaecology.

Activities	Reference incidence	Goal	Red	Yellow	Green	MATERNITY DASHBOARD											
						Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Total deliveries (per month)			>1,350	1,300-1,350	<1,300	1,506	1,334	1,392	1,226	1,256	1,173	1,326	1,313	1,319	1,425	1,256	1,324
OPD appointments (per month)		<4,000	>5,000	4,000-5,000	<4,000	7,031	6,100	2,967	2,304	6,218	6,129	5,938	5,950	3,640	3,700	2,311	5,942
Total NVD	0.99	>90%	<75%	75%-85%	>85%	66%	68%	65%	63%	63%	70%	69%	69%	73%	69%	75%	73%
Total CS	18.60%	<20%	>30%	20%-30%	<20%	33%	31%	34%	37%	36%	29%	30%	31%	26%	30%	24%	26%
MATERNITY																	
Midwife / patient ratio		50%	25%	33%	50%	1%	2%	1%	1%	2%	2%	2%	2%	2%	1%	2%	2%
Specialist / midwife ratio		90%	<80%	80%-90%	>90%	86%	86%	90%	89%	79%	81%	90%	80%	81%	90%	95%	81%
Episiotomy	10%	20%	>30%	30-25%	<25%	33%	24%	24%	40%	35%	23%	19%	18%	31%	34%	26%	36%
3rd and 4th degree tear (per month)	~5 (0%-8%) RCOG	<3	>7	4-7	<4	0	2	6	0	3	2	0	2	2	2	2	1
PPH (per month)	0.3%-1.8%	<10	>30	20-30	<20	30	40	36	39	43	30	35	46	34	48	19	40
ICU admission (per month)	<1%	<3	>7	4-7	<4	0	0	0	0	0	0	0	0	0	0	0	0
Postpartum hysterectomy (per year)	0.2-8.7/1,000	2	4	3	<2	0	0	0	0	0	0	0	0	0	0	0	0
Maternal death (per year)	<70/100,000 (<1%)	1	>2%	1%-2%	<1%	0	0	0	1	0	1	0	0	0	0	0	0

NEONATAL OUTCOMES																	
<7 Apgar score at 5 min (per month)	7/1,000	<3	>4	3-4	<4	2	0	0	0	0	0	0	0	0	0	0	0
Meconium aspiration (per month)	0.7%-5%	2	5	4	3	2	1	0	0	0	1	0	0	0	1	1	0
Birth asphyxia (per month)	1-2/1,000	4	>10	6-10	<6	5	7	8	7	10	3	8	11	12	10	13	3
Stillbirth (per month)	3-5/1,000	10	>15	11-15	<11	15	12	8	8	15	11	16	10	14	14	13	12
END (per month)	<12/1,000	10	>12	10-12	<10	12	9	8	14	6	9	7	6	15	10	4	6
NICU admission (per month)	<18/1000	25	>50	30-50	<30	77	74	82	97	97	60	69	74	62	69	36	52
Birth weight <2,500 g (per month)	14-15/1,000 (14.7%)	30	>40	35-40	<35	45	42	53	50	69	79	21	19	29	27	16	17

2.4. Limitations of the study

As this study relied on a hospital-based record review, it did not allow for interviews with women so as to inquire about certain risk factors related to sociodemographic and obstetrical characteristics. Moreover, the poor quality of the medical records made it difficult to interpret the written data, and the information provided may not reflect the severity of the patient's condition. In some cases, the diagnosis did not match what was found in the medical records.

3. RESULTS

A total of 136,519 women, who were pregnant, in labor, or postpartum up to 42 days, were admitted to the Obstetrics and Gynecology Teaching Hospital in Kerbala during the study period. Of these, 18,791 women delivered. The overall NVD rate showed an upward trend after the implementation of the MDB (68%) when compared to the NVD rate before the MDB implementation (66%); a QI improvement that was found to be highly significant (p=0.0024; **Figure 1**). The overall CS performance rate exhibited a downward trend after the implementation of the MDB (31%) when compared to the CS performance rate before the MDB implementation (33%); a QI improvement that was also found to be highly significant (p=0.0001; Figure 2).

The overall stillbirth cases revealed a downward trend after the implementation of the MDB (148) when compared to the stillbirth cases before the MDB implementation (188); a QI improvement that was marginally statistically significant (p=0.0483; Figure 3). Finally, the overall NICU admission cases was characterized by a downward trend after the implementation of the MDB (849) when compared to the NICU cases before the MDB implementation (1,155); a QI improvement that was found to be highly significant (p=0.0007; Figure 4).

4. DISCUSSION

The clinical dashboard consistently displayed ward and program activities. The transparency of data dissemination between clinicians and midwives promoted optimal patient care within the department. Early recognition of adverse performance trends supported informed decision-making and resource allocation within the local setting. According to the study's findings, the introduction of the MDB significantly reduced the CS performance rates and increased the NVD rates. CS is currently the most common surgical procedure performed on women. It is a vital technique that saves the lives of mothers and fetuses when natural vaginal birth is no longer the safest option [17].

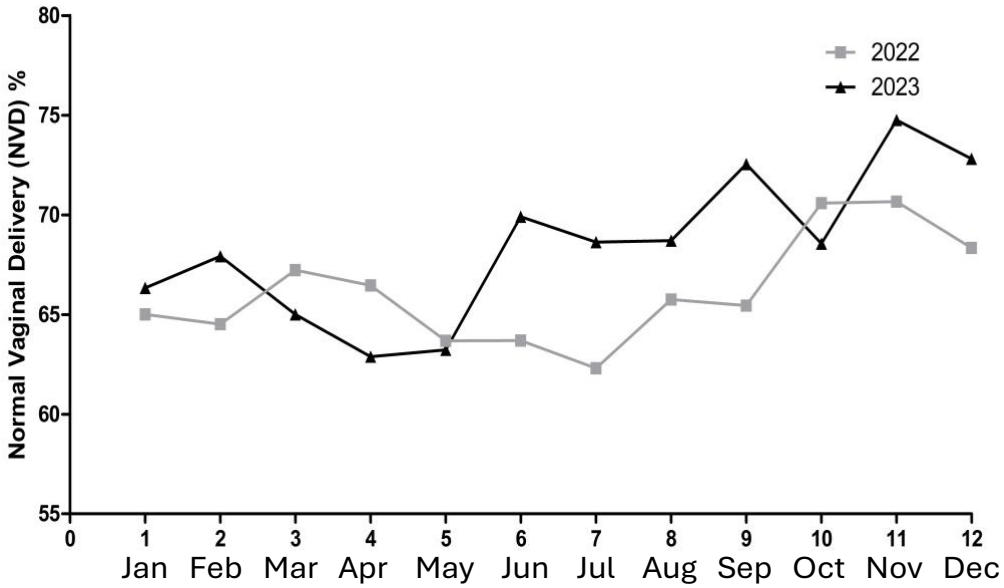

Figure 1. The monthly variations of the percentage of normal vaginal deliveries (NVD) before (2022) and after (2023) the maternity dashboard implementation in the studied hospital.

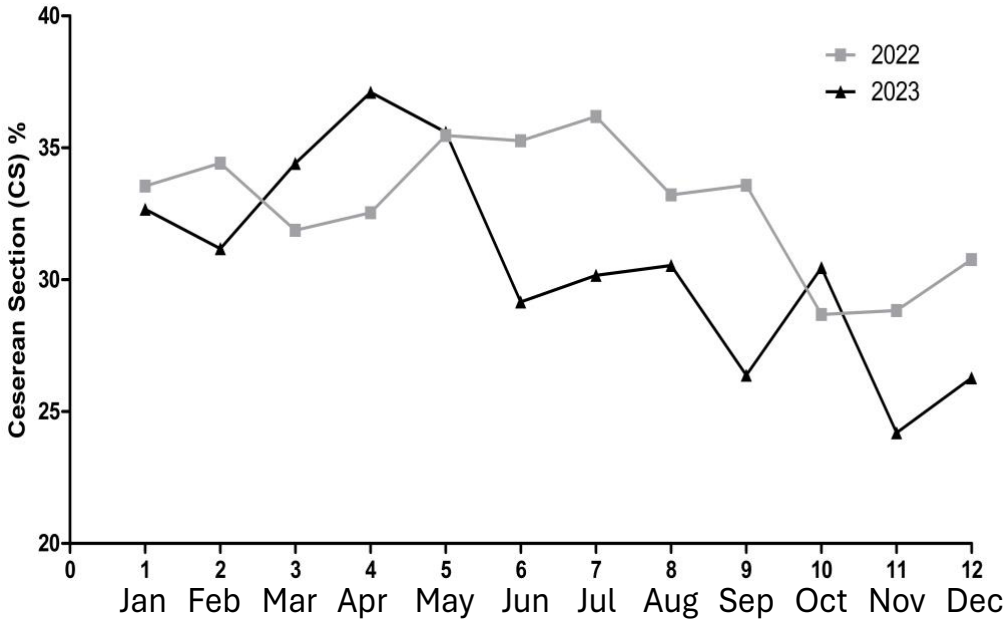

Figure 2. The monthly variations of the percentage of the performance of caesarean sections (CS) before (2022) and after (2023) the maternity dashboard implementation in the studied hospital.

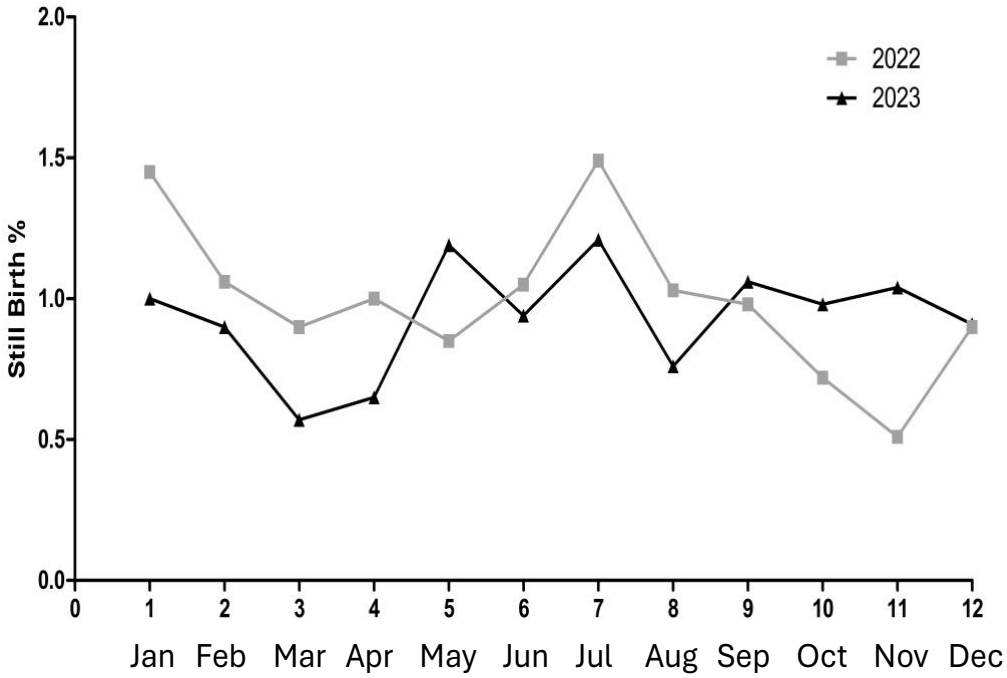

Figure 3. The monthly variations of the percentage of stillbirths before (2022) and after (2023) the maternity dashboard implementation in the studied hospital.

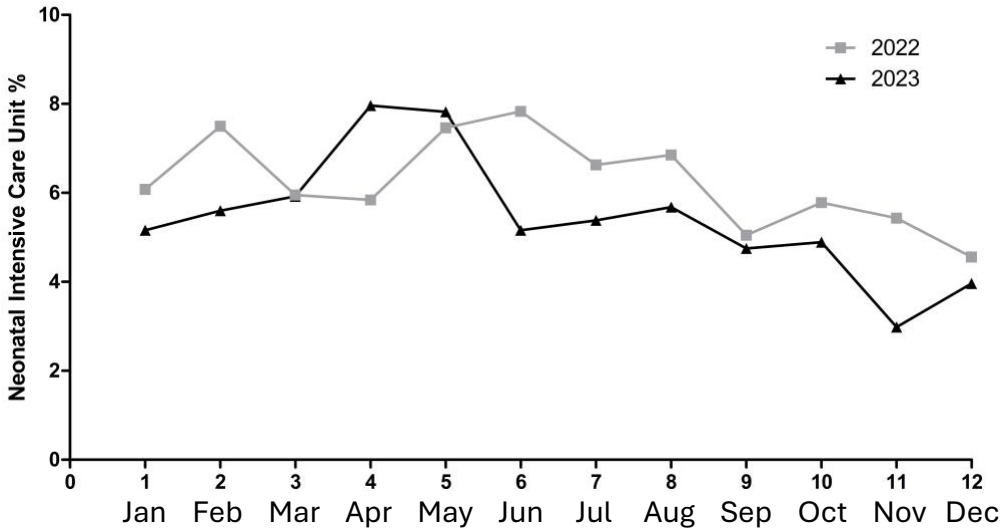

Figure 4. The monthly variations of the percentage of the neonatal intensive care unit (NICU) admissions before (2022) and after (2023) the maternity dashboard implementation in the studied hospital.

However, from a public health perspective, performing a CS for low-risk pregnancies puts mothers and fetuses at greater risk for both short- and long-term health complications [18]. The results of the present study align with those of other studies, indicating that the increasing of adherence to labor arrest criteria has significantly reduced the CS performance rates and increased the NVD rates after MDB intervention.

The MDB has highlighted the number of newborns admitted to the NICU, prompting staff discussions and inquiries in order to determine the cause. It was revealed that a specific practice had emerged: a midwife in the labor ward could ensure neonates received appropriate care from a pediatrician by admitting them to the special care baby unit when pediatric junior doctors were unavailable to evaluate them before transfer, as mandated by local regulations. The staff was aware that ensuring the correct care for the right neonate in an overwhelmed special care unit was challenging [3,4]. Local training included instructions on neonatal resuscitation [19] and the monitoring of the fetal condition during labor, so as to optimize outcomes. Additionally, as previously indicated [20], the practice of needlessly separating newborns from their mothers can increase risks.

The importance of the MDB has been well-documented in the global healthcare-associated literature, with numerous studies highlighting its role in enhancing maternal and neonatal care. A study conducted in the United Kingdom has demonstrated that the implementation of a MDB is in fact associated with a significant reduction in maternal and neonatal morbidity and mortality rates [21].

5. CONCLUSION

This study successfully used the QIs development methodology in order to identify a set of 18 core metrics that key stakeholders deemed important in assessing aspects of maternity care amenable to quality improvement initiatives. These metrics can all be assessed using routinely collected hospital data and, therefore, provide a practical system for rapidly delivering meaningful feedback to trusts concerning their clinical performance.

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CONFLICT OF INTEREST STATEMENT
The authors declare no conflicts of interest.

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