Strategies to reduce the caesarean section rate at a regional hospital in northern KwaZulu-Natal Province, South Africa

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Background. The caesarean section (CS) rate at Queen Nandi Regional Hospital (QNRH) in northern KwaZulu-Natal Province, South frica (SA), has remained above the national average for a public hospital in SA. In view of the short- and long-term complications of CS, effective strategies are required to reduce unnecessary CS.
Objectives. To identify the indications for CS and the factors that contributed to the high CS rate at QNRH, with the aim of implementing interventions to reduce unnecessary and avoidable CS without compromising mother and baby outcomes.
Methods. We conducted a 3-month retrospective audit (Q1 2024) of 100 randomly selected CS files from the labour ward birth register and from the postnatal ward. The data collected included patient demographics, referring facilities, CS category, indication for CS, Robson Ten Group classification, timing of CS, and maternal and perinatal outcomes. The CS rate for Q1 2024 was compared with Q2 2024 and Q3 2024 with and without local clinic deliveries. Referrals from the local clinics for CS in Q1 2024 were compared with institutional audits from 2020 and 2023. Tables and figures were used for analysis. Institutional ethics permission was obtained for the clinical audit and publication of the data.
Results. During the study period, there were 2 077 deliveries in total and 1 366 CSs, giving a CS rate of 66%. Among the 100 randomly selected files analysed, there were 1 set of twins, 5 stillbirths (3 due to abruptio placentae grade 3b), 96 live births, and no maternal deaths. Of the patients, 44% were aged >20 - 30 years, 41% were in their first pregnancy, 70% were referred from our local clinics, and 48% were low risk; 26% had a body mass index >40 kg/m^2, 15% were hypertensive, and 25% were HIV positive. In 47% of cases the indication for CS was fetal distress/non-reassuring cardiotocograph, followed by failed induction of labour (13%), failure to progress (6%), and breech presentation and abruptio placentae (5% each). More than 80% were urgent CSs, with more of these done during the night than during the day (37% v. 28%). A further 22% of the urgent CS were done during changeover time. Of the infants, 72% were born at a gestational age of 34 - 40 weeks and 80% had a birthweight of >2 500 - 4 000 g. All liveborn infants had a normal Apgar score. There were no maternal adverse outcomes. As expected, and owing to the short time frame for repeat in-depth analysis, there was no significant impact of CS trends when comparing Q1 2024 with Q2 and Q3 2024 for both institutional-based and population-based CS rates. Referrals from the local clinics contributed 70% towards our CS rate in Q1 2024 and remained consistently ~80% on average, when compared with institutional audits from 2020 (80%) and 2023 (85%).
Conclusion. While measures were already in place to reduce rates of unnecessary CS at QNRH, the findings from our audit show that current strategies to reduce the CS rate will be unlikely to reach the target of 28% for public sector facilities, owing to our referral pattern and the drainage areas covered by this hospital. Despite the small sample size in this audit, evidence points towards the need for a district hospital in this subdistrict to help reduce our facility CS rate.

Keywords. caesarean section indications; caesarean section rates; strategies; interventions.

S Afr J Child Health 2025;20(1):eS14. https://doi.org/10.7196/SAJCH.2025.v20i1.S14

The increase in the caesarean section (CS) rate is a public health concern worldwide. High CS rates are associated with increased maternal morbidity and mortality. Women are two to three times more likely to die from CS than from normal vaginal delivery. CS is known to be associated with an increased risk of infection, haemorrhage, thromboembolism, repeat CS and placenta accreta spectrum disorders, among others. There is no significant evidence that CS rates above a certain threshold improve long-term perinatal outcome or reduce the risk of cerebral palsy.[1,2]

The World Health Organization (WHO) recommends an ideal CS rate of 10 - 15% (2021, 2018).[3,4] Globally, the average CS rate increased to 21% (2021) and is projected to increase to 29% by 2030.[5] The Saving Mothers report (2020 - 2022) states that the CS rate in South Africa (SA) for public hospitals was 28% in 2020 and increased to 31% by the end of 2022.[6] The CS rate at private hospitals is in the range of 75 - 90%.[7,8] Queen Nandi Regional Hospital (QNRH) has a current CS rate of 66%. Noteworthy, when indicated, CS can save women's and infants' lives and must therefore be universally accessible.

The WHO and the International Federation of Gynecology and Obstetrics (FIGO) have proposed use of the Robson Ten Group Classification System (RTGCS).[9,10] This is a global standard for assessing, monitoring and comparing CS rates both within healthcare facilities and between them. The system classifies all

women into one of 10 categories that are mutually exclusive and totally comprehensive. The categories are based on five basic obstetric characteristics: parity, previous CS, onset of labour, gestational age and fetal presentation, plus number of fetuses. The purpose of the Robson classification is to identify and analyse groups of women that contribute most and least to overall CS rates. This system aids in assessing the effectiveness of strategies or interventions targeted at optimising the use of CS, assessing the quality of the data collected, and raising staff awareness about importance of these data, and their interpretation and use. The limitations of the Robson classification are that it does not include information such as the indication for CS, or pre-existing risk factors in mother and fetus that can influence the CS rate. There is also no reflection of mother and baby outcomes.

CS may also be classified according to the timing at which it must be done, as follows: category 1 – emergency (immediately life threatening); category 2 – urgent (maternal or fetal compromise, not immediately life threatening); category 3 – scheduled (needs early delivery but no compromise); and category 4 – elective (planned at a time to suit the patient and staff). This system helps standardise communication and determine the necessary time frame for delivery, with category 1 requiring the fastest possible action, i.e. within 30 minutes, and category 4 being a planned procedure, usually up to 1 - 2 weeks later.

QNRH in northern KwaZulu-Natal Province, SA, is a dedicated mother and child 'combo' hospital providing all three levels of care. The hospital receives low- and high-risk patients directly from 22 local primary health clinics and one community health clinic and all high-risk pregnancies from 16 district hospitals (DHs), covering a catchment population of 2.6 million people. There are no tertiary hospitals in the three subdistricts that refer to our regional hospital. We therefore also function as a tertiary hospital with available expertise. Fig. 1 shows the upward trajectory of annual trends in our CS rate over the past 6 years as obtained from the hospital facility information officer (FIO). Our hospital CS rates are routinely calculated weekly, monthly, quarterly, and annually for the financial year. Previous unpublished data of clinical audits done at the facility in 2020 and 2023 show that referrals from the local clinics contributed 80% and 85%, respectively, to all our CSs.

The high CS rate at our hospital is a matter of concern! CS is perceived by many women as a safer way to give birth. The fear of medical malpractice is always a concern for healthcare workers if outcomes of vaginal delivery are not as expected. To address the issue of rising CS rates, we did an audit to assess the common indications and factors that contributed to the high CS rate at QNRH.

Methods

This was a retrospective, descriptive observational study. The audit aimed to identify factors that contributed to the high CS rate at QNRH and to implement measures to reduce unnecessary and avoidable CS without compromising mother and baby outcomes. The clinical audit was done over a 3-month period (April 2024 - June 2024) that corresponded to quarter 1 (Q1) of the 2024 financial year. The author was assisted by a staff member by randomly selecting 100 CS files for different days of the week, including weekends and after hours. Patients were identified from the labour ward birth register and from the postnatal ward. For women who were discharged, files were obtained from the medical registry. Recruitment stopped when 100 files were collected. The inclusion criteria were women who delivered by CS, and infants weighing >500 g. Women who delivered vaginally were excluded. At our hospital, the decision for CS is taken by the most senior doctor on the floor or the consultant. The data collected were entered manually on a Microsoft Excel workbook (.xlsx) (Microsoft Corp, USA) by an assistant and verified by the author. All information captured was anonymous and no patient identifiers were used. The information obtained included patient demographics and referring health facility; CS category (emergency v. elective); indication for CS; Robson Ten Group classification; time of CS (normal working hours/changeover times/after hours); and maternal and perinatal outcomes. Tables and figures were used for analysis. As this was a clinical audit, ethical permission for data collection and publication was obtained from the local hospital ethics committee.

Because there are no DHs in the subdistrict of Umhlatuze, all 22 local primary clinic deliveries were added to the denominator to calculate the population-based CS rate for the study period and compare it with the facility-based CS rate for statistical purposes. The routine CS rates over next two quarters (Q2 2024 and Q3 2024) were included for comparisons of trends. In addition, the CS referrals rate from the local clinics for Q1 2024 was compared with similar data from 2020 and 2023.

Results

During the study period there were 2 077 deliveries in total, of which 1 386 (66%) were CSs. From the 100 random files (as described earlier) analysed, there were 1 set of twins (101 babies), 5 stillbirths and 96 live births. Three of the 5 stillbirths were due to grade 3b abruptio placentae in women with a scarred uterus, and the remaining 2 CS stillbirths were not suitable for vaginal delivery. The set of twins was delivered by elective CS for previous CS and twin pregnancy.

Figs 2, 3 and 4 show the demographic profiles for maternal age distribution, parity and associated comorbidities, respectively. Of the women, 44% were in the age category >20 - 30 years and 41% were having a CS in their first pregnancy. Of the 70 women referred from local clinics who had a CS, 48 were low risk with no known comorbidity. Twenty-six of the women had a body mass index (BMI) >40 kg/m^2, and one with diabetes mellitus had a live baby with birthweight 4 900 g. Fifteen women had hypertension in pregnancy. Twenty-five of the women were HIV positive (with or without other comorbidity), and 2 women were positive for syphilis. There were no maternal deaths in this cohort of women.

The indications for CS are shown in Fig. 5. In 47% of cases the indication was fetal distress/non-reassuring CTG (NRCTG). A further 13% of CSs were for failed induction of labour (IOL), 6% were for failure to progress, and 5% each were for breech presentation and abruptio placentae.

Fig. 6 shows the CS categories, with 86% urgent CSs, largely for NRCTG, followed by elective CSs at 12%.

Fig. 7 shows the Robson Ten Group classification. Group 1 (all nulliparous, ≥37 weeks, single cephalic pregnancy, spontaneous labour) and group 5 (all multiparous, ≥1 previous CS, ≥37 weeks, single cephalic pregnancy) were the greatest contributors to the CS rate (31% each).

Figs 8 and 9 show the distribution of gestational age at delivery and the birthweight categories. Seventy-two percent of CSs were at late preterm to term gestation, and 80% of the infants were within the normal range of birthweights for gestation. No babies in this analysis weighed <1 000 g.

Forty percent of CSs were done during normal working hours, which included the 12% elective CSs. The one set of twins was also delivered by elective CS. Therefore, 28% of urgent CSs were done during the day and 37% at night. Twenty-two percent of CSs were done during the afternoon shift changeover time, as shown

in Fig. 10. We further noted that of the 37 CSs done at night, the decisions for CS in 5 were made by intermediate-level medical officers (grade 2 MOs), as there were no senior MOs on that shift. On subanalysis, these were appropriately indicated CSs.

The quarterly CS trends before and after the study period obtained from the hospital FIO are shown in Fig. 11. The CS trends remain relatively constant on average at 66% for the facility and 44% when the local clinics are added to the total deliveries.

Regarding neonatal outcomes, all 96 liveborn infants had 5-minute Apgar scores >7, despite 47% of indications for CS being fetal distress based on an NRCTG. Of the 3 babies weighing >4 000 g, one, born to a mother with diabetes mellitus, weighed 4 900 g. Two mothers

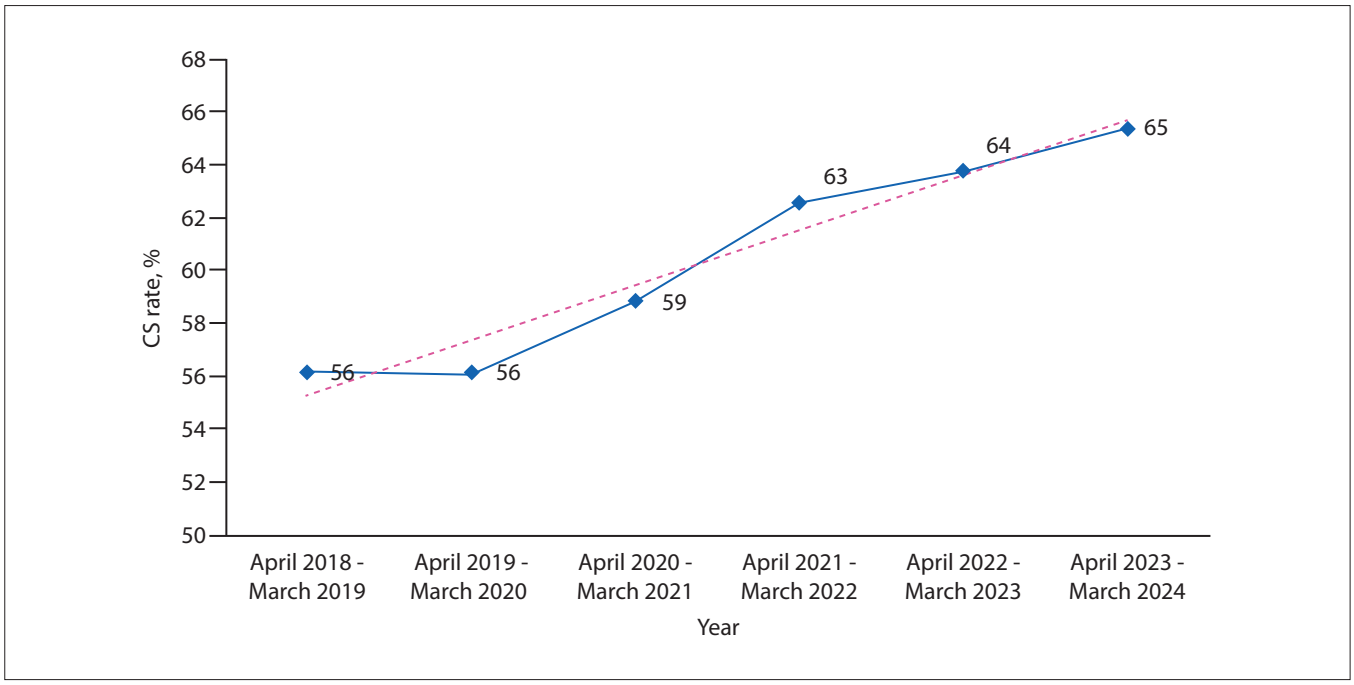

Fig. 1. Six-year trend in the CS rate. (CS = caesarean section.)

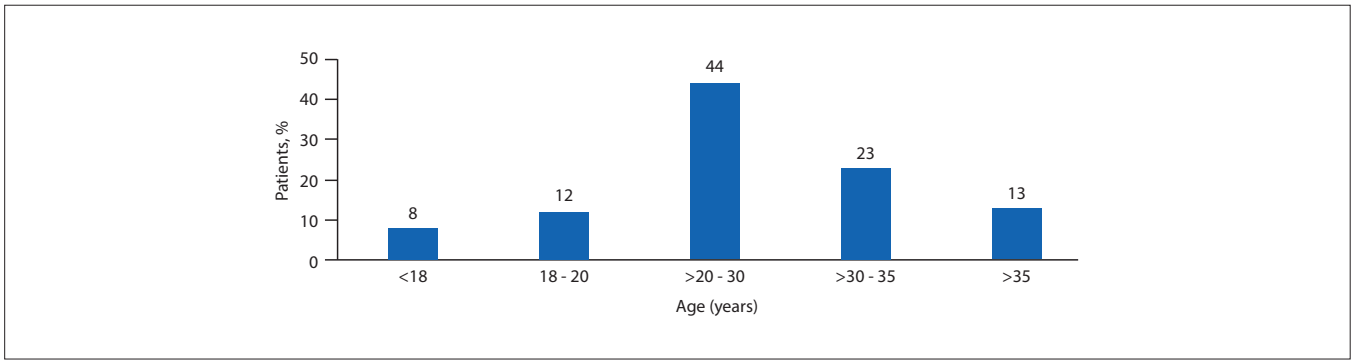

Fig. 2. Maternal age (N=*100).*

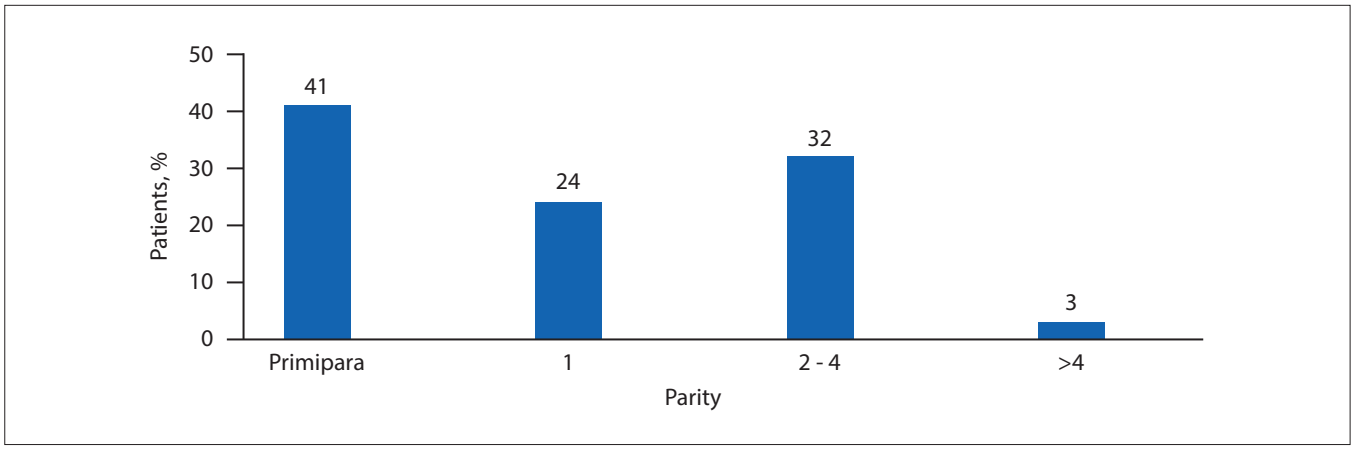

Fig. 3. Parity (N=*100).*

with syphilis in pregnancy were appropriately treated and the babies were tested rapid plasma reagin negative at birth. There was no neonatal morbidity or mortality up to the time of discharge of the mother from our postnatal ward. Further follow-up of the babies was not done.

Compared with the CS rate from Q1 2024, the facility-based CS trends for the next two quarters were unchanged at 66%, with a minimal decline in the population-based CS rate (including local clinic deliveries) from 47% to 44%. This is not unexpected considering the short period to see any impact on CS rate for the subsequent two quarters.

Discussion

Our hospital provides a combo service, i.e. functions at district, regional and tertiary levels of care. There is no DH within the subdistrict of our hospital to perform the low-risk CSs. Of the 70 women referred from local clinics for CS, 40 were low risk, and their CSs could have been done at a DH if one had been available. The average CS rate at our hospital was 66%, which is more than double that for public hospitals in SA.[6,11] Tertiary-level hospitals generally have higher CS rates owing to very high-risk pregnancies.

Through our clinical audit, we observed that patient demographics with regard to maternal age and parity did not seem to play a role in

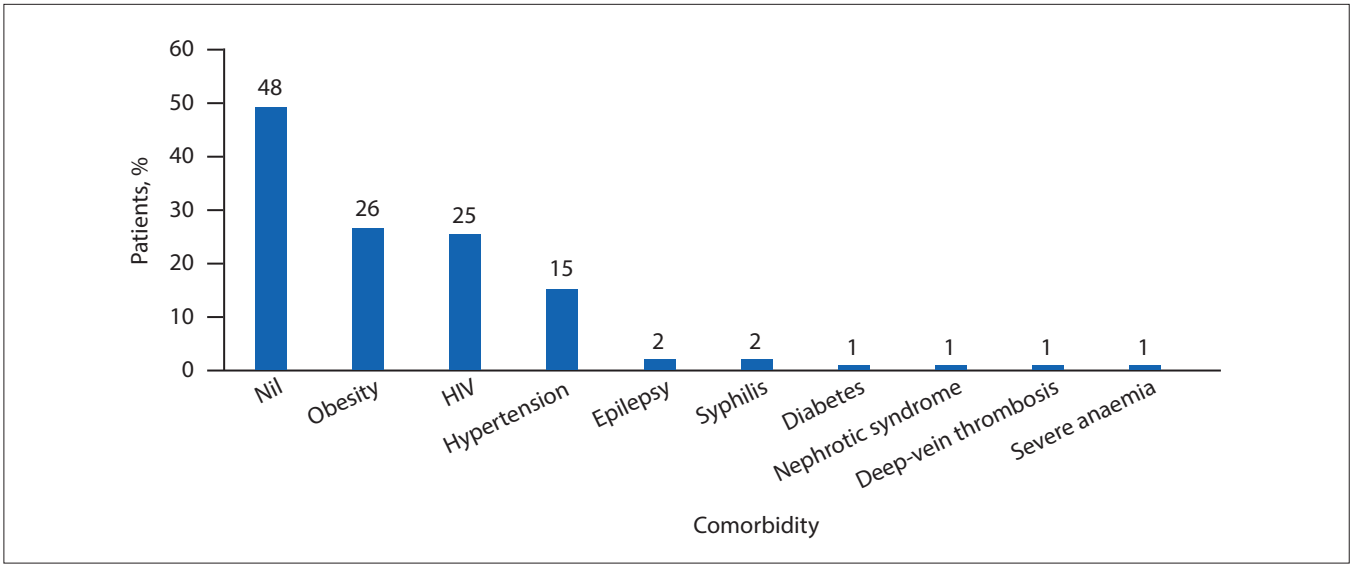

Fig. 4. Comorbidities (N=100). Some patients had more than one comorbidity.

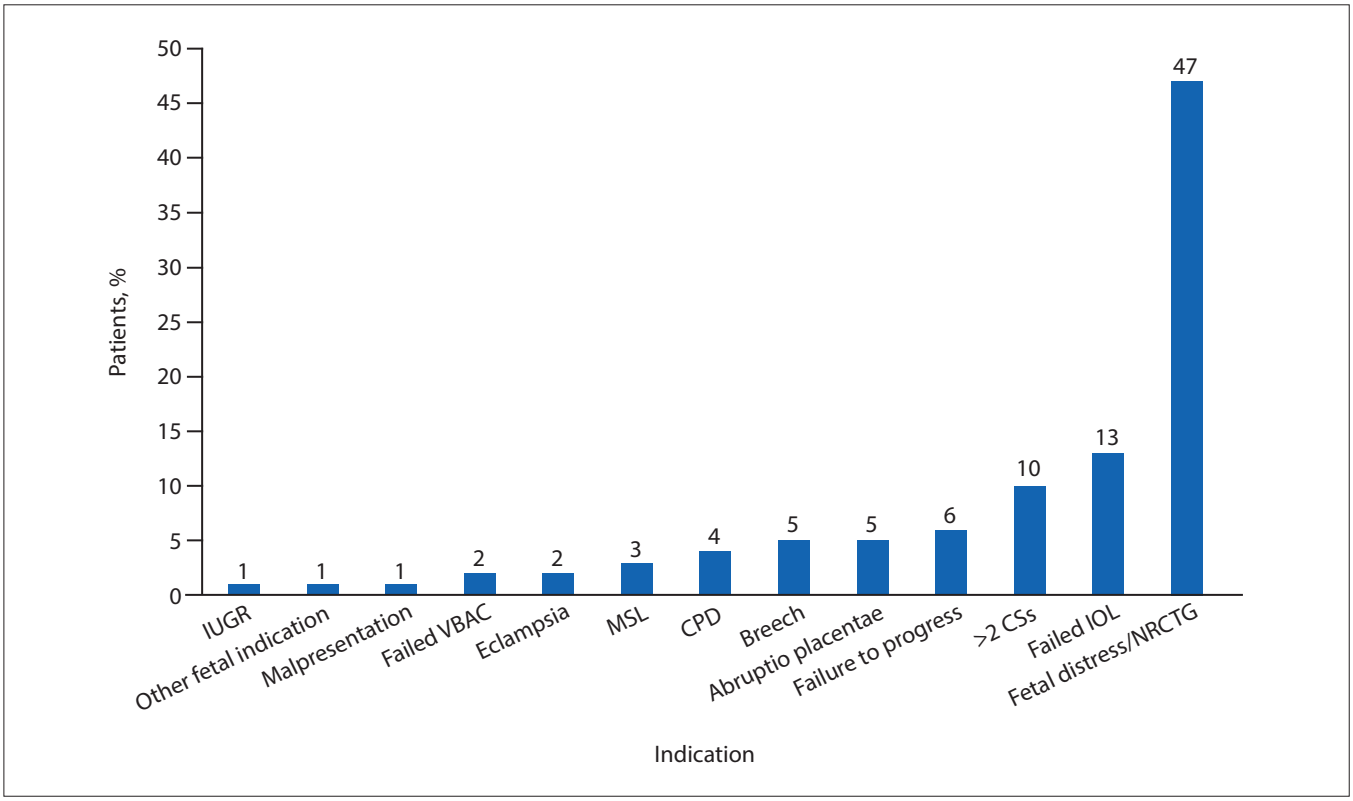

Fig. 5. Indications for CS (N=100). (CS = caesarean section; IUGR = intrauterine growth retardation; VBAC = vaginal birth after CS; MSL = meconium-stained liquor; CPD = cephalopelvic disproportion; IOL = induction of labour; NRCTG = non-reassuring cardiotocograph.)

contributing to our high CS rate. In contrast, age and parity, including socioeconomic status and multiple births, were significantly associated with high CS rates in sub-Saharan Africa.[12,13] Our hospital routine departmental weekly, monthly and quarterly perinatal audits show that the majority of women who deliver here are in the age category 20 - 30 years and in their first pregnancy, and hence contribute proportionally higher to our CS rate.

Nearly half the indications for CS were an NRCTG. Cardiotocography is the only non-invasive method we use for assessing fetal wellbeing in at-risk pregnancies. It has major limitations in diagnosis of fetal distress because of its known subjectivity in interpretation, poor reproducibility and high false-positive rate. While the intention is to deliver well babies, it is important that CTGs are correctly interpreted, and that CSs are appropriately indicated and done timeously. On review of the NRCTGs in this audit, >90% (*n*=43/47) were classified as pathological/non-reassuring based on FIGO classification.[14] A further 6% of our CSs were due to failure to progress. In addition to the training of all new clinical staff in Essential Steps in Managing Obstetric Emergencies (ESMOE), we have further scaled up CTG training for all healthcare workers in the maternity unit, including regular fire drills on a weekly basis during ward rounds and daily morning audit meetings. Clinical assessment and the correct plotting of the partogram were also strengthened during the consultant labour ward rounds, to reduce CS for failure to progress. The CS was appropriately indicated for 5/6 women identified as having failure to progress. As a mandatory requirement and clinical governance, the ESMOE training is audited, and records are kept for evidence as a monitoring and evaluation tool.

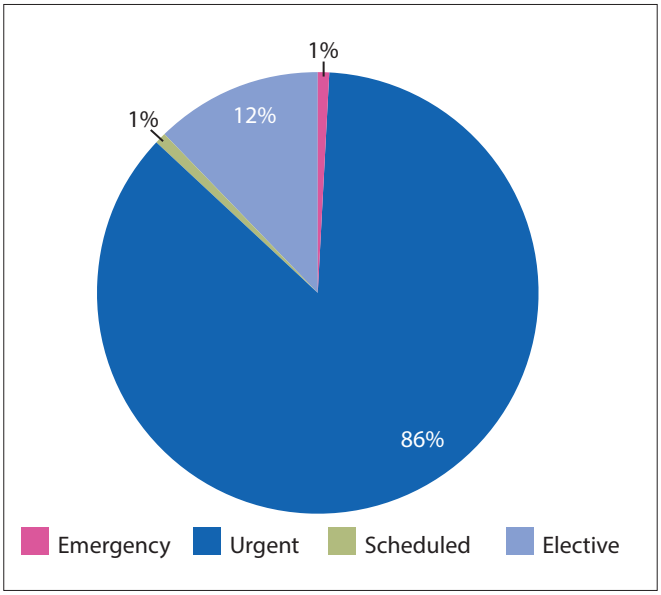

Fig. 6. CS categories (N=100). (CS = caesarean section.)

The indications for CS for failed IOL and failed vaginal birth after CS (VBAC) were 13% and 2%, respectively. In addition to counselling and consent from the patients, all decisions regarding IOL and VBAC receive approval by a senior doctor/consultant as a strategy to reduce unnecessary CS. There is ample evidence in the literature to consider selected vaginal breech delivery.[15,16] We have adopted a proactive approach to external cephalic version for breech presentations and use of instrumental delivery when indicated as another strategy to reduce avoidable CS. Despite training, support and supervision, many junior MOs tend not to perform instrumental deliveries for fear of litigation, especially when a senior person is scrubbed in theatre or attending to another emergency. Training is ongoing to improve skill and confidence among junior staff in use of instrumental delivery when the criteria are met.

In the study group, 8% were teenagers aged <18 years and 13% were aged >35 years. We work together with our primary healthcare workers and district clinical specialist teams on strengthening contraception uptake to reduce unplanned pregnancies among teenagers and uptake of sterilisation in women who have completed their families.

A quarter of the women in the study had a BMI >40 kg/m^2. This is not unexpected, since all women with a BMI >40 kg/m^2 are referred from local clinics to the hospital for delivery. Additionally, women with a BMI >50 kg/m^2 are referred from DHs to the regional hospital for delivery. It is worth noting that half the women (48%) had no known comorbidity; all of them were referred from the local clinics, suggesting that their CSs could have been done at a DH. This means that the CS rate at QNRH would be half the current rate (66%) if there was a DH in our subdistrict. Furthermore, 70% of the women in the study were referred from local clinics, meaning that at most, only 20% needed regional hospital care. Data from our FIO statistics show that the average rate of HIV positivity among our pregnant women is 30%. From the files analysed, 25% were HIV positive. At our facility, HIV

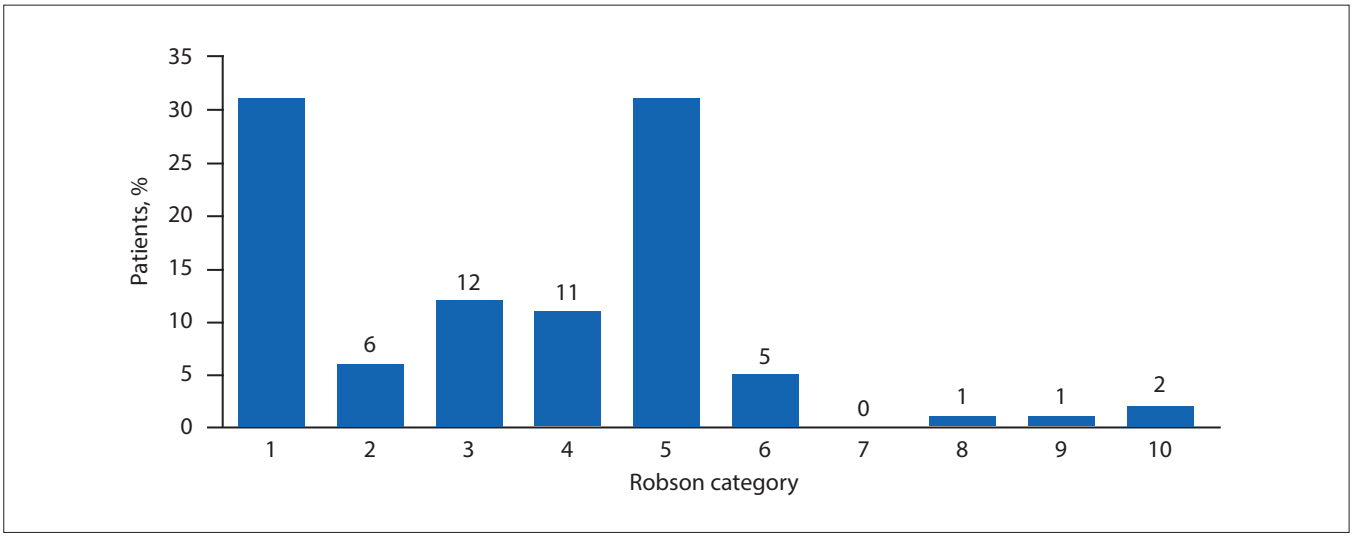

Fig. 7. Robson Ten Group classification (N=100).

positivity is not an indication for CS. We have recently seen an increase in syphilis in pregnancy. Two of the women in the present study tested syphilis positive. Syphilis has no impact on our CS rate. Diabetes is relatively uncommon among rural black African women. CS in women with diabetes is performed according to obstetric indications. One woman in the present study had diabetes and delivered 4 900 g baby. She also had a high BMI and was referred from a local clinic in labour. All women diagnosed with cardiac disease are referred to tertiary hospitals in Durban for delivery.

According to the RTGCS, most of the CSs fell into categories 1 and 5. Although the subanalysis for Robson classification was not done for the next two quarters for comparison, we identified term nulliparous women in spontaneous labour (group 1) and term multiparous women with previous CS (group 5) as drivers for the high CS rate and provide feedback to our staff on an ongoing basis to implement measures to reduce CS rates in these categories. Such measures include reviewing the indications for primary CS, such as the place of assisted vaginal deliveries or delaying performance of CS due to NRCTG, without fear of litigation when the outcome is not as expected despite following evidence-based practice. Reducing primary CS will also reduce the chance of CS in a subsequent pregnancy. The challenges of using the RTGCS in analysing indications for CS, as alluded to earlier, are also acknowledged.

There was also a concern about the high proportion of CSs done during the night when junior staff are on duty. Excluding the 12 elective CSs and the one done over a weekend, more urgent CSs were done during the night than during the day (37 v. 28). A further 22 urgent CSs were done during the afternoon changeover time when both day and night teams are on duty. The majority of our MOs are grade 1. From this audit, 25% of decisions for emergency CS at night were taken by grade 2 MOs. Despite the smaller numbers of grade 3 MOs and consultant shortages, we have implemented that all decisions for emergency CS must be discussed with the consultant on the floor or the most senior doctor – preferably a grade 3 MO/

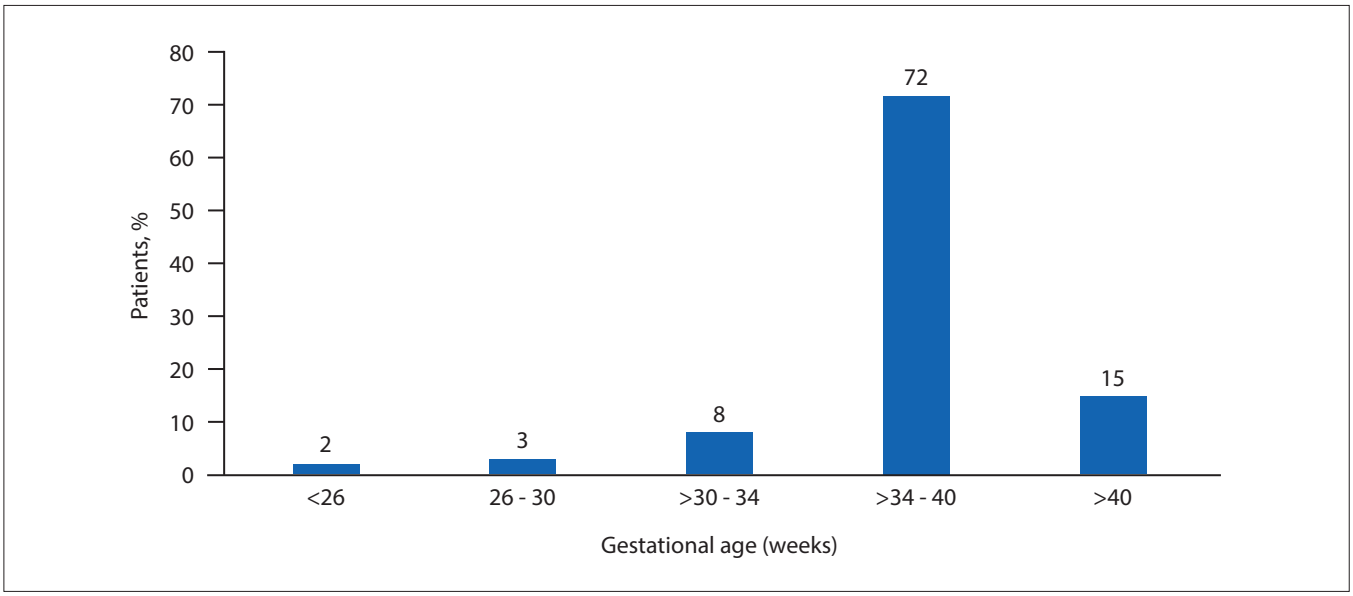

Fig. 8. Gestational age at delivery (N=100).

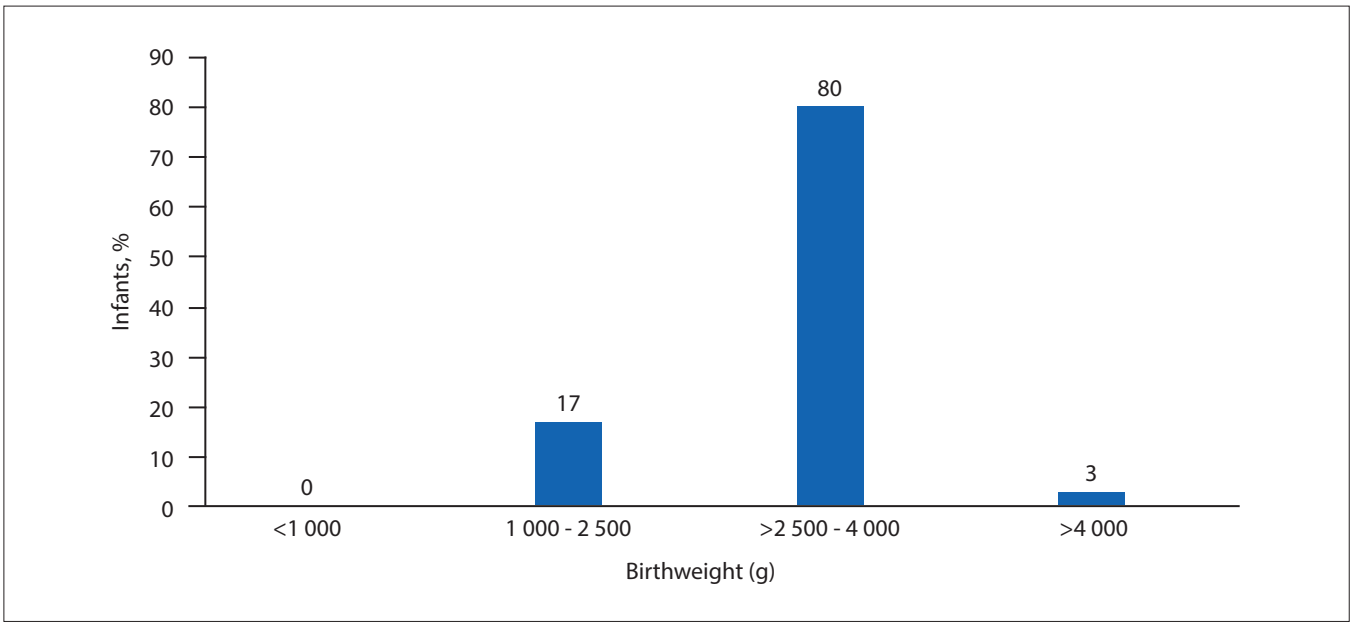

Fig. 9. Birthweight categories (N=101).

clinical manager. Seventy-two percent of CSs were at late preterm/term gestation and 80% of infants had a normal birthweight. The latter finding is not unexpected, as it corresponds to the gestation at which most of our patients deliver, when compared with our hospital routine quarterly perinatal delivery statistics.

Additional strategies to reduce primary and avoidable CS have included addressing sociocultural factors, such as the misconceptions and myths among expectant parents that CS delivery is safer than vaginal delivery. All healthcare workers are tasked to educate expectant parents on the medical indications for CS.

We do not perform CS on maternal request. We also aim to provide training and support to our MOs regarding evidence-based practices for labour and delivery, to reduce fear of litigation when the maternal and/or perinatal outcome is not as expected. It is acknowledged that there is definitely a place for CS delivery when clinically indicated, and strategies to reduce the CS rate must not compromise maternal and/or perinatal outcome. The goal is for a well mother to safely deliver a healthy baby!

For a true reflection of our CS rate, the total clinic deliveries were included in our calculations.

As mentioned earlier, the facility-based CS rate and the population-based CS rate were analysed separately. The CS trends for the previous four quarters and the next two quarters were unchanged at 66% for the facility and 44% for the population the hospital serves. This finding is not unexpected considering the short period to see any impact on CS rate for the subsequent two quarters. The slight reduction in the population-based CS rate (47% to 44%) for the subsequent two quarters is due to an increased number of normal vaginal deliveries at the local clinics. However, this figure is still above the national average of 28% for a population-based rate.

CS can be a lifesaving procedure for mother and baby, but as per the WHO, rates above 10% of live births are not associated with reductions in maternal and newborn mortality. The WHO has produced a list of recommendations on non-clinical interventions to reduce unnecessary CS.[17]

The interventions targeted at women include childbirth training workshops that address childbirth fear and pain, advantages and disadvantages of CS and vaginal delivery, and the birth process. The interventions targeted at healthcare professionals include implementation of evidence-based clinical practice guidelines and a mandatory second opinion for CS indication. Interventions targeted at health organisations or facilities by collaborative midwifery-obstetrician models of care primarily address intrapartum CSs.[17]

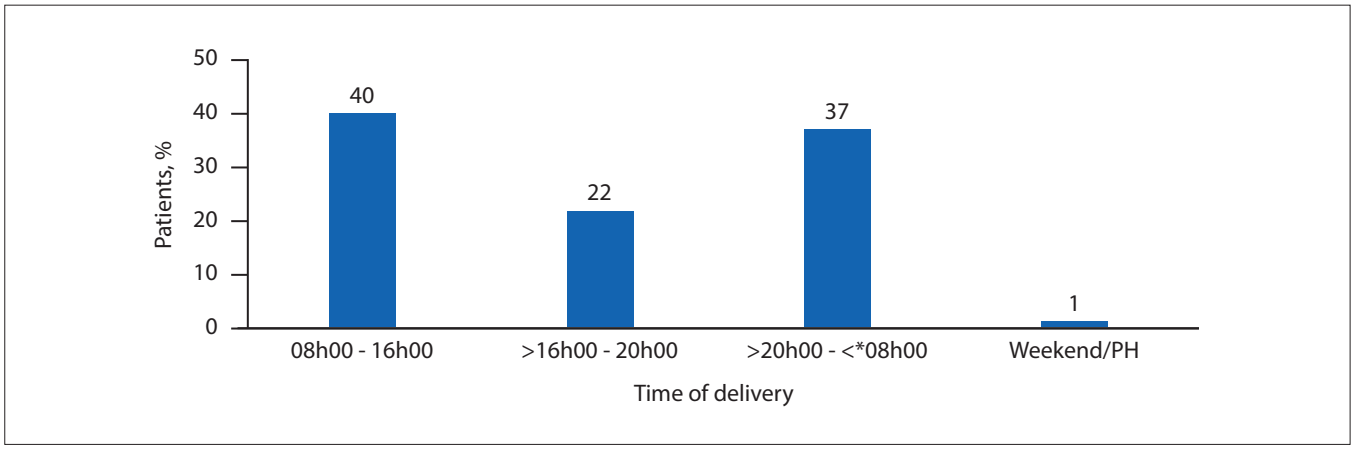

*Fig. 10. Time of CS deliveries (N=100). (CS = caesarean section; PH = public holiday; *Next day.)*

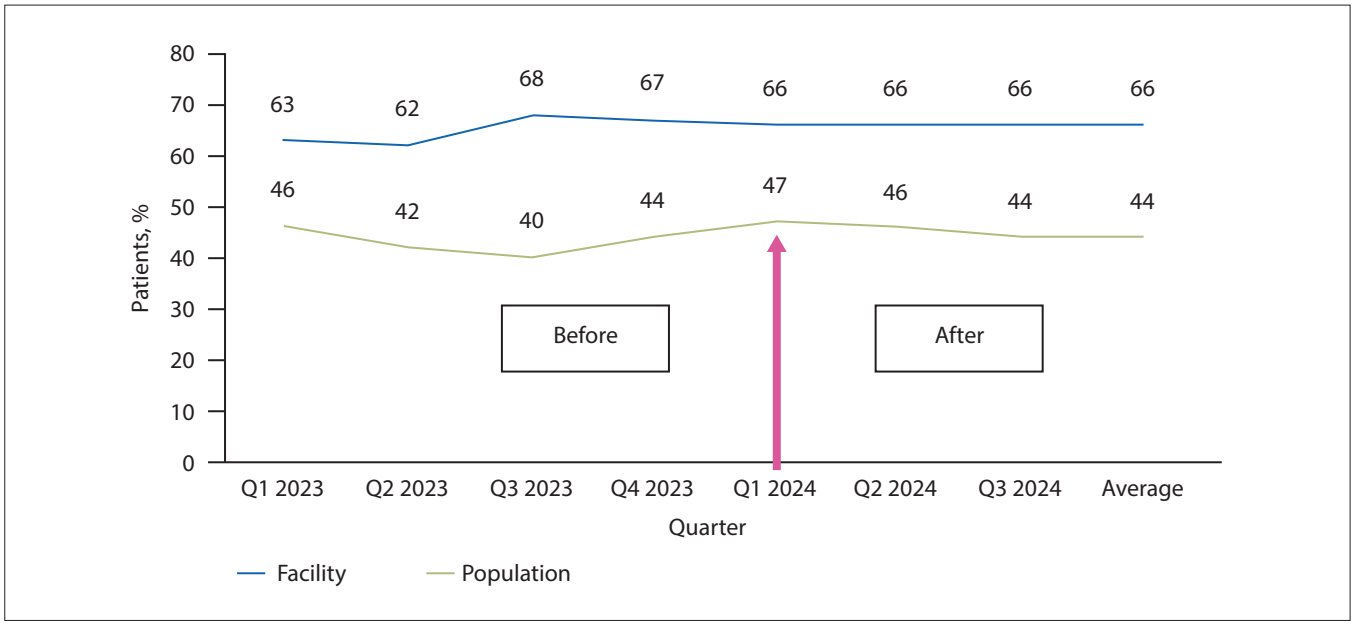

Fig. 11. Quarterly comparisons of CS rates showing before (Q1 - 4 2023) and after (Q2 - 3 2024) trends. (CS = caesarean section.)

Despite the small numbers and limitations of this audit, we believe that feedback from audits will be helpful in reducing CS rates.

Study limitations

This was a random retrospective audit of files, so there may be selection bias. The study was conducted at one hospital and is therefore not generalisable to the population at large.

Conclusion

While measures are already in place to reduce rates of unnecessary CS at QNRH, the findings from our audit show that strategies to reduce the CS rate will not enable us to reach the target 28% for public sector facilities, owing to our referral pattern and drainage areas served. Data from previous clinical audits in 2020 and 2023 showed that referrals from our local clinics contributed 80% and 85%, respectively, to our CSs. Despite the small sample size, it is evident that having a DH nearby would reduce our CS rate by an estimated 50%.

Recommendations

A follow-up audit with larger numbers is planned to compare CS rates following the increased awareness of the common indications for our CSs and identify further strategies, including adoption of the WHO recommendations on non-clinical interventions targeting women, healthcare professionals and health organisations to further reduce unnecessary CS.

Data availability. The datasets generated and analysed during the present study are available from the corresponding author (LG) on reasonable request. Any restrictions or additional information regarding data access can be discussed with the corresponding author.

Declaration. None.

Acknowledgements. The author thanks Dr Michael Mphatsoe for assisting with collection of files and Ms Owethu Mkhize for capturing the data on Excel.

Author contributions. Sole author.

Funding. None.

Conflicts of interest. None.

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Received 15 August 2025. Accepted 27 November 2025.