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Obstetric Comorbidity Burden and Maternal Healthcare Resource Utilisation Among Referred Women: A Prospective Cohort Study

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ABSTRACT

Background: Early anticipation of critical-care and inpatient resource needs is important in tertiary obstetric referral services. The Obstetric Comorbidity Index (OBCMI) may offer operational value beyond prediction of severe maternal morbidity.
Methods: This prospective cohort study included 150 consecutively referred women at more than 28 weeks of gestation who were admitted in labour or for emergency obstetric management. OBCMI was calculated on admission. Hospital stay, intensive care unit (ICU) admission, and caesarean delivery were examined across score bands. Analyses were exploratory because ICU admission was also included among the study's severe maternal morbidity indicators.
Results: Mean hospital stay rose from 4.6±1.5 days at score 0 to 7.9±2.2 days at scores 4–5 and 11.5±2.5 days at scores 6–7 (ANOVA $F[4,144]=32.05$; $p<0.001$). ICU admission increased from 3.5% at score 0 to 40.0% at scores 4–5, 75.0% at scores 6–7, and 100% in the single woman scoring ≥8 ($p<0.001$). Caesarean delivery increased from 28.1% at score 0 to 76.0%, 100%, and 100% in the corresponding higher bands ($p<0.001$). Among women with scores ≥4, 17/34 (50.0%) required ICU care and 28/34 (82.4%) underwent caesarean delivery.
Conclusion: Increasing admission OBCMI was associated with longer hospitalisation and greater use of ICU and operative-delivery resources in this referral cohort. The score may support anticipatory planning and escalation discussions, but it should not mandate a level of care without clinical assessment and external implementation validation.

Keywords: Obstetric Comorbidity Index; resource utilisation; intensive care; hospital stay; caesarean delivery.

INTRODUCTION

Tertiary maternity units must often allocate scarce resources before the trajectory of an obstetric emergency is fully apparent. High-dependency or intensive care beds, senior multidisciplinary personnel, operating theatre access, blood products, and prolonged inpatient care may all be required with little notice. Severe maternal morbidity is therefore not only a clinical outcome but also an important driver of hospital resource use.1 In referral systems, the need for early planning is amplified because women frequently arrive with interacting medical and obstetric problems after transfer from facilities with lower levels of maternal care.

The Obstetric Comorbidity Index (OBCMI) converts maternal age and weighted medical and obstetric conditions into a single admission score. Bateman et al. developed the index to predict severe morbidity or death, and later studies confirmed that increasing scores are associated with adverse maternal outcomes.[2-4] Subsequent work has focused increasingly on clinical triage. Ruppel et al. developed a comorbidity score for clinical use,[5] Bolanthakodi et al. evaluated OBCMI in an Indian tertiary setting,[6] and recent studies from Qatar and the United States examined risk stratification within high-acuity or transferred populations.[7,8]

The possibility that OBCMI could forecast resource requirements is attractive. A score available at admission could prompt early anaesthesia review, reserve blood products, support theatre preparedness, and alert critical-care services. However, a statistical association does not establish that a numerical threshold should automatically determine placement. Levels of maternal care are intended to match patient needs with institutional capability, but individual disposition must also consider current physiology, diagnosis, trajectory, and local capacity.[9] Indian obstetric critical-care literature similarly emphasizes timely recognition and coordinated multidisciplinary management rather than reliance on any isolated score.[10,11]

This secondary analysis examined the association of admission OBCMI with hospital length of stay, ICU admission, and caesarean delivery among referred obstetric patients. The aim was to determine whether increasing comorbidity burden could provide useful anticipatory information for service planning while avoiding overstatement of an unvalidated mandatory triage protocol.

MATERIALS AND METHODS

Study design and population: This was a prespecified secondary analysis of a prospective cohort undertaken from February to May 2026 at Umaid Hospital, Dr. Sampurnanand Medical College, Jodhpur. Consecutively referred women at more than 28 weeks of gestation who were in labour or required delivery/emergency obstetric management were enrolled after consent. Women discharged before delivery, lost before postpartum assessment, or carrying a fetus with a major anomaly incompatible with life were excluded.

Admission assessment: Demographic, referral, medical, and obstetric data were collected using a structured proforma. The modified clinical OBCMI was calculated at admission from documented comorbidities and pregnancy-related conditions. Participants were managed according to institutional protocols; the score was not used as a mandatory placement rule.

Resource outcomes: Total hospital stay was measured in days. ICU admission and mode of delivery were obtained from hospital records and treatment logs. OBCMI was examined in six score bands (0, 1, 2–3, 4–5, 6–7, and ≥8) and in three pragmatic categories (0–1, 2–3, and ≥4). Because ICU admission was one of the indicators contributing to the parent study's SMM classification, ICU utilisation was treated here as an operational outcome and not as independent validation of SMM prediction.

Statistical analysis: Continuous variables were summarized as mean±SD and categorical variables as frequencies and percentages. Mean stay was compared across score bands by one-way analysis of variance; ICU and caesarean rates were compared using chi-square tests as reported in the thesis. The score ≥8 band contained one participant and was interpreted descriptively. Two-sided $p<0.05$ was considered significant. Analyses were performed in IBM SPSS Statistics version 26.0. The available aggregate tables permitted arithmetic verification of ICU and caesarean counts, but not patient-level adjusted modelling.

RESULTS

The cohort included 150 referred women; 107 (71.3%) were from rural areas and 104 (69.3%) were unbooked. Mean age was 27.27±5.35 years. The score distribution comprised 57 women (38.0%) with score 0, 28 (18.7%) with score 1, 31 (20.7%) with scores 2–3, 25 (16.7%) with scores 4–5, eight (5.3%) with scores 6–7, and one (0.7%) with a score ≥8.

Hospital stay lengthened with increasing OBCMI. Mean stay was 4.6±1.5 days at score 0, 5.4±2.1 days at score 1, 5.6±1.9 days at scores 2–3, 7.9±2.2 days at scores 4–5, and 11.5±2.5 days at scores 6–7. The overall difference was significant ($F[4,144]=32.05$; $p<0.001$). The single woman scoring ≥8 stayed seven days and should not be interpreted as evidence of a downward trend. Women who developed SMM stayed longer than those without SMM (9.2 vs 5.2 days; $p<0.001$), demonstrating the inpatient burden associated with serious complications.

Table 1. Resource utilisation according to OBCMI score band

OBCMI band	n	Hospital stay, mean±SD days	ICU, n (%)	Caesarean, n (%)
0	57	4.6±1.5	2 (3.5)	16 (28.1)
1	28	5.4±2.1	3 (10.7)	16 (57.1)
2–3	31	5.6±1.9	3 (9.7)	15 (48.4)
4–5	25	7.9±2.2	10 (40.0)	19 (76.0)
6–7	8	11.5±2.5	6 (75.0)	8 (100.0)
≥8	1	7.0	1 (100.0)	1 (100.0)
Total	150	—	25 (16.7)	75 (50.0)

Hospital stay: one-way ANOVA $F(4,144)=32.05$, $p<0.001$. ICU across bands: $\chi^2(5)=43.31$, $p<0.001$. Caesarean delivery across bands: $\chi^2(4)=17.83$, $p<0.001$.

ICU utilisation increased sharply at higher scores. ICU admission occurred in 2 of 57 women (3.5%) at score 0, 3 of 28 (10.7%) at score 1, 3 of 31 (9.7%) at scores 2–3, 10 of 25 (40.0%) at scores 4–5, 6 of 8 (75.0%) at scores 6–7, and the single woman scoring ≥8. Overall, 25 women (16.7%) required ICU admission. When dichotomized at ≥4, 17 of 34 women (50.0%) required ICU care compared with 8 of 116 (6.9%) below the threshold.

Caesarean delivery also increased across score bands. Sixteen of 57 women (28.1%) with score 0 underwent caesarean delivery, compared with 19 of 25 (76.0%) at scores 4–5 and all women at scores ≥6. Overall, 28 of 34 high-score women (82.4%) underwent caesarean delivery compared with 47 of 116 (40.5%) women scoring <4. In the three-category analysis, higher scores were also accompanied by higher preterm-delivery rates and lower mean birth weight, although these neonatal measures were outside the primary resource-utilisation objective.

Table 2. Clinical outcomes across pragmatic OBCMI risk categories

Category	n (%)	SMM rate, %	Caesarean rate, %	Preterm rate, %	Mean birth weight, g
Low (0–1)	85 (56.7)	5.9	37.6	4.7	2736
Moderate (2–3)	31 (20.7)	9.7	48.4	6.5	2600
High (≥4)	34 (22.7)	52.9	82.4	35.3	2270
Overall	150 (100)	17.3	50.0	12.0	2604

Across categories, p<0.001 for SMM, caesarean delivery, preterm delivery, and mean birth weight. Categories are descriptive and not a prospectively implemented triage protocol.

Table 3. Operational interpretation of admission OBCMI

Score band	Observed pattern	Potential operational response
0–1	Shorter stay; low ICU use	Routine assessment; continue standard physiological surveillance
2–3	Intermediate and heterogeneous utilisation	Senior review based on diagnosis and trajectory; reassess if condition changes
4–5	Longer stay; ICU 40%; caesarean 76%	Early multidisciplinary notification and preparedness for escalation
≥6	Very high observed ICU and operative use; only 9 women	Urgent senior multidisciplinary assessment; disposition determined clinically

This is an exploratory planning framework derived from observed associations. It is not a validated mandatory ward/HDU/ICU allocation protocol.

DISCUSSION

Increasing OBCMI at admission was strongly associated with three measures of maternal healthcare utilisation: duration of hospitalisation, ICU admission, and caesarean delivery. The gradient was clinically substantial. Women scoring 4–5 stayed approximately three days longer than those scoring 0, and women scoring 6–7 stayed almost seven days longer. Half of all women with scores ≥4 required ICU care, and more than four fifths underwent caesarean delivery. These findings suggest that the score may help tertiary units anticipate—not prescribe—resource needs.

The direction of association accords with the logic of the original OBCMI. Bateman et al. developed the score from conditions associated with end-organ injury, death, and ICU admission; rising scores therefore reflect accumulating burden that plausibly leads to more complex management and longer recovery.[2] External validation by Metcalfe et al. confirmed the score's usefulness across a different population,3 while Easter et al. demonstrated the feasibility of prospective clinical scoring.[4] The present findings extend this evidence to a referred Indian cohort and emphasize operational outcomes visible to hospital planners.

Recent work has moved closer to the referral question. McCarter et al. evaluated antepartum transfers to a level-IV facility and found that increasing OBCMI was associated with SMM, supporting its possible use in risk-appropriate referral decisions.[8] The Qatar validation similarly proposed admission scoring as a mechanism to red-flag women for timely multidisciplinary input.[7] Our cohort had a much higher acuity than an unselected delivery population: nearly one quarter scored ≥4, half delivered by caesarean, and one in six entered ICU. These characteristics explain why the score may be especially informative in the receiving tertiary unit.

The length-of-stay gradient is operationally important. Longer hospitalisation affects bed turnover, nursing workload, medication and laboratory use, and the ability of a referral hospital to accept additional transfers. A simple score derived from information already available on admission could contribute to daily capacity discussions. However, the observed mean of seven days in the ≥8 band is based on one participant and must not be treated as a reliable estimate. Larger studies should evaluate median stay, time to discharge, and competing effects of transfer or death.

The relation with ICU use was the steepest observed gradient, but it also presents the central methodological limitation. ICU admission was included among the indicators used to classify SMM in the parent study. Moreover, admission thresholds depend on local bed availability, monitoring capacity, and clinician preference. The result therefore demonstrates association with actual resource use in this hospital; it does not prove that OBCMI independently predicts physiologic critical illness. Future studies should distinguish planned monitoring from organ-support ICU admission and adjust for current severity, diagnosis, and treatment limitations.

Caesarean delivery increased from 28.1% at score 0 to 76.0% at scores 4–5 and 100% at scores ≥6. Many OBCMI components—severe hypertensive disease, placenta praevia/accreta, prior uterine surgery, or fetal death—can influence delivery planning directly, so the association is clinically expected. It should not be interpreted as a causal effect of the score or as a recommendation for operative delivery. Rather, higher scores can alert teams that theatre readiness and anaesthetic assessment may be more frequently required.

The observed gradients support a cautious workflow. A score of 0–1 may be managed through the usual pathway while maintaining standard surveillance; a score of 2–3 may prompt diagnostic review and rescoring when the condition changes; and scores ≥4 may justify early notification of senior obstetric, anaesthesia, blood-bank, neonatal, and critical-care teams. These actions are compatible with risk-appropriate maternal care frameworks,[9] but final disposition must remain based on the woman's current clinical condition and institutional resources. The thesis proposal of mandatory HDU admission for scores 4–5 and mandatory ICU admission for scores ≥6 is too strong for 150 patients, particularly because only nine women scored ≥6.

Strengths include prospective admission scoring, consecutive recruitment, and complete capture of in-hospital utilisation. Limitations include the single-centre design, small high-score strata, lack of patient-level multivariable adjustment, and absence of direct cost or HDU data. Caesarean delivery and ICU admission are affected by local practice, and length of stay can be influenced by social or referral factors not captured by OBCMI. The analysis may therefore be regarded as exploratory. Multicentre prospective studies should assess calibration, incremental value beyond physiological early-warning scores, cost outcomes, and whether score-informed planning reduces delays without unnecessary escalation.

CONCLUSION

Higher admission OBCMI was associated with progressively longer hospital stay and substantially greater ICU and caesarean-delivery utilisation among referred women at a tertiary centre. The score may be useful for early multidisciplinary notification and capacity planning, particularly at values ≥4. It should not be used alone to mandate ward, HDU, ICU, or operative management. External implementation studies that separate clinical severity from disposition practices are needed before a score-based pathway is adopted.

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ETHICAL APPROVAL: The study was undertaken after approval from the Institutional Ethics Committee. Written informed consent was obtained from all participants before enrolment.

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