Original Article

Analysis of Adverse Outcome Index, Weighted Adverse Outcome Score, and Severity Index as Novel Quality Indicators of Obstetric Care in a Tertiary Care Hospital

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Abstract

Objective: To analyze the adverse outcome index, weighted adverse outcome score and Severity index calculated from routinely collected obstetric data as indicators of quality of obstetric care.

Methodology A descriptive cross-sectional study was carried out at the Department of Obstetrics and Gynecology, Khyber Teaching Hospital, Peshawar, from January to December 2020. Using non-probability consecutive sampling approach, all pregnant women who were admitted for obstetric care and experienced any of ten prespecified adverse maternal and neonatal outcomes(neonatal death> 2500g,and > 37 weeks, in-hospital maternal death, uterine rupture, maternal admission to intensive care unit, delivery birth trauma, return to the operating room, intensive neonatal unit admission with >2500g and > 37 weeks for more than one day, Apgar <7 at 5 minutes, blood transfusion> 4 units and fourth-degree perineal laceration) were included in the study and the data was used to calculate previously standardized quality indicators like adverse outcome index, Weighted adverse outcome scores and Severity Index. Data was analyzed using SPSS 23.

Results: Our obstetrics unit witnessed 4975 deliveries during the research period. Mean age, parity and gestation were 25.20±4.32,2.7±2.34 and 36.35±2.50 respectively. On admission, 98.6% of pregnant women were un-booked. The average adverse outcome index was 14.8/1000, the weighted adverse outcome score was 0.96 and severity index 65%. In our study population, the adverse outcomes contributing most to the AOI were neonates born with low APGAR score (40.5%), Maternal ICU admission (21.6%) and Blood transfusion (17.6%).

Conclusions: Adverse outcomes contributing most to the AOI in our setup were neonates born with low APGAR score, unplanned maternal ICU admission and Blood transfusion. With the help of these novel quality indicators, policy makers can plan concerted efforts in improving access, utilization of antenatal care and use of evidence-based guidelines to impart care and evaluation of services provided by individual maternity hospitals.

Key Words: Adverse obstetric outcomes, Adverse outcome index (AOI), Quality indicators, Patient safety, Maternity care, Lower and Middle income countries (LMIC), Perinatal mortality & morbidity.

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Introduction

The quality of medical care and patient safety has recently received considerable attention from patients, regulatory health authorities, and the media. Pregnancy and childbirth are the third leading cause of hospitalization.[1] Obstetrics is a unique medical field with high expectations regarding safety and high consequences of harm.

Adverse obstetric events complicate 9-10% of deliveries leading to immense physical, psychological, social and organizational chaos.[2] Maternal, and perinatal mortality rates and cesarean section rates have traditionally been used as obstetric care, quality indicators.[3] Undoubtedly, we need more uniform and

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standardized indicators that give us a snapshot of the whole process safety and not only certain aspects of the process of obstetric care.[4]

Low-quality obstetric care in low- and middle-income countries contributes to high in-hospital maternal mortality.[5] Criterion based clinical audits are increasingly being suggested to measure and improve obstetric care in these settings.[6,7]

The United States of America, National Perinatal Information Center (NPIC) developed adverse Outcome Index (AOI), weighted adverse outcome score(WAOS) and severity index as quality indicators to overcome the limitations of existing quality and safety indicators for obstetrical care.[8] Amongst the aforementioned quality indicators, AOI includes ten adverse maternal and neonatal events related to labour and delivery including maternal in-hospital death, neonatal or intrapartum death, ruptured uterus, maternal admission to the intensive care unit, birth trauma in the newborn, return to the operating room, admission to a neonatal intensive care unit >2500gand >37 weeks for >24 hours, Apgar Score <7 at fifth minute, maternal blood transfusion> four units and 4th degree perineal laceration.[9]

Measuring Adverse Outcome Index (AOI) in maternity hospitals focusses on intrapartum care where serious perinatal adverse outcomes occur because of insufficient teamwork and communication barriers among the obstetric professionals.[10] The reported adverse outcome index from public sector maternity hospitals in developed countries like USA, Canada, and Netherland was 9.2%,7%, and 9% respectively while developing countries like Brazil had the figures approaching 21%.[11] Global literature from Asia and Africa, was deficient in terms of studies, measuring quality of obstetrics care through indicators like adverse outcome index.

In order to address obstetric care quality research gap, especially in a region where data on adverse outcomes is often scarce or underexplored, our study aimed to analyze the index of adverse events using routinely available data in a high-risk obstetric care hospital of Peshawar, Pakistan. It's the first study of its kind on the subject in Pakistan; the results will establish a benchmark for local and global comparison, address lack of data and foster development of safety protocols for promoting maternal and neonatal wellbeing.

Methodology

A descriptive cross-sectional study was conducted in the Department of Obstetrics and Gynaecology, Khyber Teaching Hospital. Ethical approval was obtained from the Institutional Research & Ethical review Board ref no 690/DME/KMC, ensuring adherence to ethical standards throughout the research.

The study involved a manual medical chart review of all pregnant women receiving maternity care in our facility from January to December 2020, after informed written consent. The study included clinical data of pregnant women with adverse events, that was collected on predesigned proforma based on the review of medical charts regarding patients' age, parity, BMI, gestational age, and mode of delivery and post-natal outcomes. Pregnant women who delivered outside the facility referred for intensive care, termination of pregnancy, and anomalous fetuses were excluded from the study.

There were 1271 cesarean sections and 3704 vaginal deliveries giving a total of 4975 births. Seventy-four deliveries were associated with adverse outcomes during the study period. We calculated the AOI, proposed and defined by Mann etal[11]as the number of deliveries complicated with one of ten specified adverse outcomes divided by total number of deliveries, gives a measure of the frequency of deliveries with adverse events it is purely a quantitative measure

AOI= Number of adverse events/ Number of deliveries

The American College of Obstetricians and Gynecologists 'quality improvement and patient safety committee assigned a weighted score to each adverse event representing the severity of the outcome like a score of 750 for maternal death, a score of 400 for term neonatal death and a score of 60 for maternal ICU admission.[11]

Weighted adverse outcome score(WAOS) was calculated by dividing the total points of all adverse events by number of all deliveries. WAOS which is a cumulative measure of the degree of adverse events in a given institution during a period, whereas severity index measures average severity of each adverse outcome.

Weighted adverse outcome score(WAOS) = Total Score/ Number of all deliveries

Severity Index(SI)= Total Score/ Number of Adverse events

Data was entered and analyzed in SPSS package version 23. For quantitative data like age, parity, gestational age, basal metabolic index (BMI), mean and standard deviation were calculated. Frequency and percentage were calculated for qualitative data like adverse obstetric events.

Results

Seventy-four deliveries were associated with adverse outcomes during the study period. The average AOI was 14.8/1000 and the weighted adverse outcome score was 0.96. In our study population, the adverse outcomes contributing most to the AOI were neonates born with low APGAR score (40.5%), Maternal ICU admission (21.6%) and Blood transfusion (17.6%). Table I & II

Table I: Adverse Obstetric Events.

Adverse Event	N(%)	Points	Total
Maternal Death	2(2.7%)	750	1500
Intrapartum or neonatal Death	2(2.7%)	400	800
Uterine Rupture	1(1.4%)	100	100
Maternal admission to ICU	16(21.6)	65	1040
Birth Trauma	1(1.4)	60	60
Return to OR	5(6.8)	40	200
NICU admission>2.5 kg & >24 hours	3(4.1)	35	105
APGAR<7 at 5 minutes	30(40.5)	25	750
Blood Transfusion	13(17.6)	20	260
4 perineal tears	1(1.35)	5	5
Total points			4815

Mean age, parity and gestation were 25.20±4.32,2.7±2.34 and36.35±2.50 respectively. On admission 98.6% of pregnant women were un-booked,48.6% were multigravida and 77% had cesarean delivery. Table III

Table II: Quality Indicators

Quality Indicator	Value
Adverse Outcome Index (No of deliveries with adverse event /No of Deliveries)	74/4975=14.8/1000
Weighted Adverse Outcome Score (Total point/All deliveries)	4815/4975=0.96
Severity Index (Total points/Deliveries with event)	4815/4975=65

Table II: Demographic characteristics of study population.

Variable		Value
Mean Age		24.81±4.14
Mean Parity		2.8±2.4
Mean Gestational Age		36.25±2.4
Booking status	Booked	1(1.6%)
	Un-Booked	63(98.4%)

Discussion

Our study, demonstrated that novel quality indicators like adverse outcome index, weighted adverse outcome scores and severity index can be easily calculated from hospital-based data currently collected in routine obstetric care and operationalized for local and international comparison.[12,13]

Our study reported an AOI of 14.8/1000. Study from Brazil with one of highest cesarean section rates globally, reported AOI of 21% somewhat higher than our study with neonatal ICU admission contributing mostly to adverse events followed by blood transfusions. Adverse events were common in the 18-34 years age group and multigravida similar to our study. Most of pregnant women in Brazilian study were rural and unaccompanied by a companion or partner depicting different social and cultural scenarios than our study population.[14,15]

Data from the multi-center Canadian birth registry reported AOI of 7.2%, WAOS I.6% and SI of 7.4% with third and fourth-degree perineal tears contributing to 50% of events followed by low APGAR scores and NICU admission. Nevertheless, maternal death, uterine rupture, neonatal death and maternal ICU admission were rarely recorded adverse events in this study in sharp contrast to our study which has a high severity index of 65% showing high impact adverse outcomes as expected in any developing country, busy maternity unit, where most of pregnant women fail to access and utilize proper family planning services and antenatal care.,[16]

A Dutch multicenter study reported an average AOI of 9.2% with severe postpartum hemorrhage followed by NICU admission and third and fourth-degree tears contributing to adverse outcomes. This study, however modified the adverse outcome to Dutch context and used postpartum hemorrhage instead of blood transfusions and included NICU admission >37 weeks. In our study the third most common adverse event was blood transfusion mostly done in the event of antepartum and postpartum hemorrhage. Interestingly, Blood transfusion> 4 units is included as an adverse event even when done with appropriate indication. Local adaptation of adverse events and potential weighting scores allocated to each adverse event will further authenticate these measures of obstetric care quality.[17]

A multicenter study in the United States of America, involving 15 hospitals and 28,536 deliveries reported a mean AOI of 9.2% (range, 5.9-16.6%), a value that was heavily influenced by perineal tears (third and fourth degree) and admissions to the neonatal ICU.[18] Our

study reported only one fourth degree during study period but relatively increased occurrence of high scoring adverse obstetric events like maternal death, NICU admission and uterine rupture, pointing towards substandard antenatal and intrapartum care in a developing country,.

A single center Spanish study reported AOI ranging from (3.48%-5.92%) over four years with third and fourth-degree perineal tears and Low APGAR scores contributing most to adverse events.[19] In contrast to the reported findings of the above mentioned studies, our AOI and WAOS were comparable to global literature but severity index was 65%, indicating the occurrence of adverse events with high scores like maternal death, ICU admission, neonatal death, and uterine rupture.

This can be explained by the fact that 98.6% of our study population included pregnant women who lacked antenatal booking and landed for emergency care in our maternity unit after receiving suboptimal obstetric care elsewhere. This dilemma is faced by public sector tertiary care hospitals in developing countries but unfortunately limited data is available in the context of AOI, WOAS and SI across Asian and African countries for meaningful comparison and extrapolation, where these quality indicators can critically evaluate ongoing maternity care in any setup. [20]

The strength of our study is that it's the first study in Pakistan, that analyzed AOI, WAOS and SI as indicators of the quality of obstetric care. The limitation of our study is that it is a single center study for a period of one year, which can be circumvented by planning multicenter studies that assess temporal trends over years regarding indicators of obstetric care quality for local and international comparisons

Conclusion

Adverse outcomes contributing most to the AOI in our setup were neonates born with low APGAR score, unplanned maternal ICU admission and Blood transfusion. With the help of these novel quality indicators, policy makers can plan concerted efforts in improving access, utilization of antenatal care and use of evidence-based guidelines to impart care and evaluation of services provided by individual maternity hospital.

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