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Research paper

Obstetric patients' health-related quality of life before and after intensive care

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ABSTRACT

Background: Intensive care admissions during pregnancy, childbirth, and postpartum period are relatively well investigated. However, very little is known about these obstetric patients' health-related quality of life (HRQoL) before and after critical care.
Objective: The objective of this study was to assess obstetric patients' HRQoL before intensive care admission (baseline) and at 6 months after discharge (follow-up)
Design: This was a retrospective database study. In a 5-year period, the data of all women admitted to the intensive care unit (ICU) during pregnancy, delivery, or up to 42 days postpartum were analysed.
Methods: Four multidisciplinary ICUs of Finnish University hospitals participated. The HRQoL was assessed using the EuroQol-5D (EQ-5D) instrument with utility score (EQsum) and visual analogue scale (EQ-VAS).
Results: A total of 283 obstetric patients were identified from the clinical information system. Of these, 99 (35%) completed the EQ-5D questionnaires both at baseline and follow-up, and 65 of them (23%) completed EQ-VAS. The comparison of patients' EQsum scores before intensive care admission and after discharge showed that patients' HRQoL remained good (0.970 vs 0.972) (max 1.0) or increased (0.788 vs 0.982) in 80.8% of the patients. Patients reported improved overall health on the EQ-VAS at 6 months follow-up (EQ-VAS mean, 71.86 vs 88.20; $p \leq 0.001$) (max 100). However, 19.2% of the patients had lower HRQoL (EQsum mean 0.987 vs 0.798) at follow-up. Following intensive care, 15% of the patients had more pain/discomfort, and 11% expressed more depression/anxiety. Multiparous patients were more likely to suffer from worsened depression/anxiety ($p = 0.024$).
Conclusion: In the majority of the obstetric patients, HRQoL at 6 months follow-up remained good or had increased from baseline. However, nearly one-fifth of the patients had impaired HRQoL after discharge. Thus, intensive care management should take in to consideration follow-up program after intensive care of ICU-admitted obstetric patients.

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1. Introduction

Intensive care admissions during pregnancy, childbirth, and postpartum period are relatively well investigated, and studies have been conducted in developing as well as in developed countries.[1] The main reasons for the admissions include obstetric haemorrhage and hypertensive complications, regardless of the countries where studies have been conducted.[2–5] However, a considerable difference between countries can be found regarding mortality; in high resource countries, intensive care unit (ICU) mortality is very low.[6,7] In comparison, the number of non-survivors in developing countries is notably high.[8,9] Despite previous studies of ICU-admitted obstetric patients, very little is known about their health-related quality of life (HRQoL) before and after critical care.

To determine the HRQoL of an ICU-admitted obstetric population, a retrospective database study in four multidisciplinary ICUs in Finland was performed. The objective of the present study was to assess obstetric patients' HRQoL before intensive care admission (baseline) and at 6 months after discharge from ICU (follow-up). This study provides information that could be useful for development of maternity care, childbirth, and obstetric intensive care.

2. Methods

2.1. Study design and settings

A retrospective database study in four multidisciplinary ICUs of Finnish university hospitals was carried out. Permission to maintain a study register and approval for data collection were granted by the National Institute for Health and Welfare and participating university hospitals. Data were derived from hospital databases (Clinisoft, Intensium) and the Medical Birth Register (BR) database. The protocol of this study was approved by our hospital Ethics Committee (R12050H). As only anonymised data were used, no informed consent was required.

During a 5-year period from January 2007 to December 2011, the data of all obstetric patients admitted to the ICU in any trimester of pregnancy, during delivery, or up to 42 days postpartum were analysed. Obstetric intensive care admissions were searched retrospectively from the clinical information system (Clinisoft) using the Acute Physiology and Chronic Health Evaluation (APACHE) III classification, which is compulsory recorded data for all ICU-admitted patients. The classification system consists of two options: an APACHE III score, which can provide initial risk stratification for severely ill patients and predictive equation, which uses APACHE III scores and reference data on disease categories to provide risk estimates for hospital mortality for ICU-admitted patients.[10] In this study, patient selection was based on the disease category “other gynaecological disease,” which included diagnoses related to pregnancy, delivery, and postpartum period. Disease category was used only for patient selection. The data of all women aged 18–50 years were considered. The data relating to the same person in different registers were identified by the person's social security number and could be combined for research purposes. Gynaecological patients (non-pregnant), those with missing BR data, and those who died were excluded. The actual study population consisted of those patients who completed the EuroQol-5D (EQ-5D) questionnaires both at baseline and follow-up.

Data concerning maternal and neonate characteristics were collected. These included age, causes of admission (i.e., hypertensive complications, obstetric haemorrhage, other obstetric causes, and non-obstetric causes), APACHE II (a version preceding APACHE III, applied during the initial data collection), Simplified Acute Physiology Score II, Sequential Organ Failure Assessment, Therapeutic Intervention Scoring System 76 data, and ICU length of stay (LOS), which were retrieved from the hospital database. Additionally, previous deliveries, number of fetuses, type of delivery (i.e., vaginal, vacuum extraction, planned section, urgent section, and emergency section), hospital LOS, gestational age, birth weight, situation of the child at the age of 1 week (i.e., home, postnatal ward, neonate ward, or other hospital), and perinatal mortality were retrieved from the BR database.

2.2. Health-related quality of life measurement

Obstetric patients' HRQoL was assessed using the short EQ-5D instrument. It is a non-disease–specific instrument developed by EuroQol Group. There is a literature to support the validity and reliability of the EQ-5D instrument and its adequacy to use in HRQoL measures.[11] In addition, the EQ-5D is an appropriate instrument for measuring quality of life in critically ill patients and is extensively used in intensive care research.[12,13] EQ-5D is available in many languages in a standardised format and has population reference data for a specific country or international region.[14] The EQ-5D is a licensed product by the EuroQol Group.[15]

The EQ-5D instrument consists of two parts; a descriptive system and the visual analogue scale (EQ-VAS). The descriptive system comprises five domains: (i) mobility; (ii) self-care; (iii) usual activities; (iv) pain/discomfort; and (v) anxiety/depression. Each of these five domains has three levels: no problems, moderate problems, and severe problems. A person completing the EQ-5D indicates the level that best describes his or her experience of problems in each domain. Together the individual domains constitute a utility score, which facilitates classification of patients into various health states. Answers to questions in all five domains can be converted into one single summary index (EQsum), with a score of 1.00 indicating full health and 0 standing for death. The EQ-VAS records respondent's self-rated health state on a scale of 0–100; 100 represents “best imaginable state” and 0 “worst imaginable health state”.[16]

With the EQ-5D instrument, the data were collected continuously of critically ill patients in all the ICUs that participated in this study on behalf of the organisations. The data were initially collected for administrative purposes, and researchers have received permission to use the data. The HRQoL before ICU admission (baseline) was estimated retrospectively, and the evaluations were performed during the ICU stay. Respondents were asked to estimate their health status at the time that preceded intensive care admission by choosing the most suitable option from the three-level EQ-5D domains and to indicate their present health state by the EQ-VAS. The interviews were conducted by intensive care nurses or physicians. The follow-up period was 6 months after discharge from the ICU. The data pertaining to this period were collected by a telephone interview or by mailing questions to the respondents to fill and return to a nominated person in each ICU that participated in the study. The EQ-VAS was included in both baseline and follow-up questionnaires. All EQ-5D questionnaires (baseline and follow-up) were recorded in the Clinisoft by the interviewer or by the nominated person. Obstetric patients' utility scores (EQsums) were calculated by one of the authors.

2.3. Statistical analysis

All identified patients were divided into four subgroups on the basis of the EQ-5D questionnaires they had responded to: (1) baseline and follow-up (2) only baseline (3) only follow-up, and (4) missing. Maternal and neonate demographics were compared between the subgroups to identify any statistically significant differences between these groups. Maternal and neonatal basic

characteristics were compared using the Kruskal–Wallis test, the Fisher exact test and the Mann–Whitney U test. The maternal characteristics data comprised a total of 283 obstetric patients and the neonatal data a total of 305 newborns. The results are expressed as percentages or median with interquartile range (IQR). For the actual study population that responded to the baseline and follow-up questionnaires, the EQ-5D domains were analysed separately using the McNemar test. During the follow-up period patients demonstrated some direction of change in each EQ-5D domain, labelled as worsened, same, or improved. The EQsum and EQ-VAS scores were compared between baseline and follow-up using the Wilcoxon test. Statistical significance was defined as *P* value of less than 0.05; however, in demographic data comparisons between patient groups, Bonferroni-adjusted *P* value of 0.0083 was used. Changes in the EQsum and EQ-VAS between baseline and follow-up were reported as worsened, same, or improved. In this study, a minimum difference of 0.074 in the EQsum and 7 points in the EQ-VAS was considered clinically important,[17,18] in keeping with the mean minimum difference value found in a review of the tool used in a variety of patient population.[19] All statistical analyses were performed using SPSS 15.0 (SPSS Inc., Chicago, IL, USA).

3. Results

3.1. Obstetric patients and neonates demographic

In total, 328 patients were identified from clinical information systems over a 5-year period (2007–2011). Of these patients, 45 were excluded (37 gynaecological patients, seven patients with missing BR information, and one maternal death that occurred in ICU); thus, 283 patients were eligible for analysis and comprised the actual study population (Fig. 1). The EQ-VAS was completed by 65 (23%) of those patients who responded at baseline and during follow-up. The leading cause of ICU admission among the 99 study patients was hypertensive complications (62.6%), followed by obstetric haemorrhage (20.2%). The majority of the deliveries were caesarean sections (CSs); 62.6% were urgent CSs, 12.1% were planned CSs, and 4% were emergency CSs. Preterm birth (<37 weeks of gestational age) was recorded in 57.4% of the deliveries. Low birth weight (LBW) (<2500 g) was recorded in 52.8% of the neonates, and 44.4% of the neonates needed treatment in neonate ward or other hospital at the age of 1 week. Perinatal mortality was 3.7%. *P* values ranged from 0.010 for "Child at the age of one week" between subgroup "Home care," "Postnatal ward", Neonate ward," and "Other hospital" to 0.997 for the Therapeutic Intervention Scoring System 76. However, the differences in maternal or neonate demographics between the four subgroups, i.e., baseline and follow-up, only baseline, only follow-up, and missing, have no significant differences while Bonferroni-adjusted *P* value of 0.0083 was used (Table 1).

3.2. Health-related quality of life

There were no statistically significant differences in the domains of pain/discomfort, depression/anxiety, or self-care and usual activities before and after admission to intensive care (Table 2). Only mobility showed a statistically significant improvement (McNemar's test; $p = 0.021$). However, during the follow-up, 15 patients (15.5%) had worsened pain/discomfort and 11 patients (11.1%) had worsened depression/anxiety compared to baseline (Table 3). Patients with worsened depression/anxiety at 6 months follow-up had a higher rate of emergency CSs than other types of delivery (9.5% [n = 1] vaginal deliveries, 8.3% planned CSs [n = 1], 8.1% [n = 1] urgent CSs, 75% [n = 8] emergency CSs). Multiparous patients were more likely to suffer from worsened depression/anxiety (Fisher's exact test; $p = 0.024$). Patients reported improved overall health on the EQ-VAS at 6 months follow-up (Wilcoxon test; $p \leq 0.001$). Table 4 presents the EQsum and EQ-VAS scores at baseline and

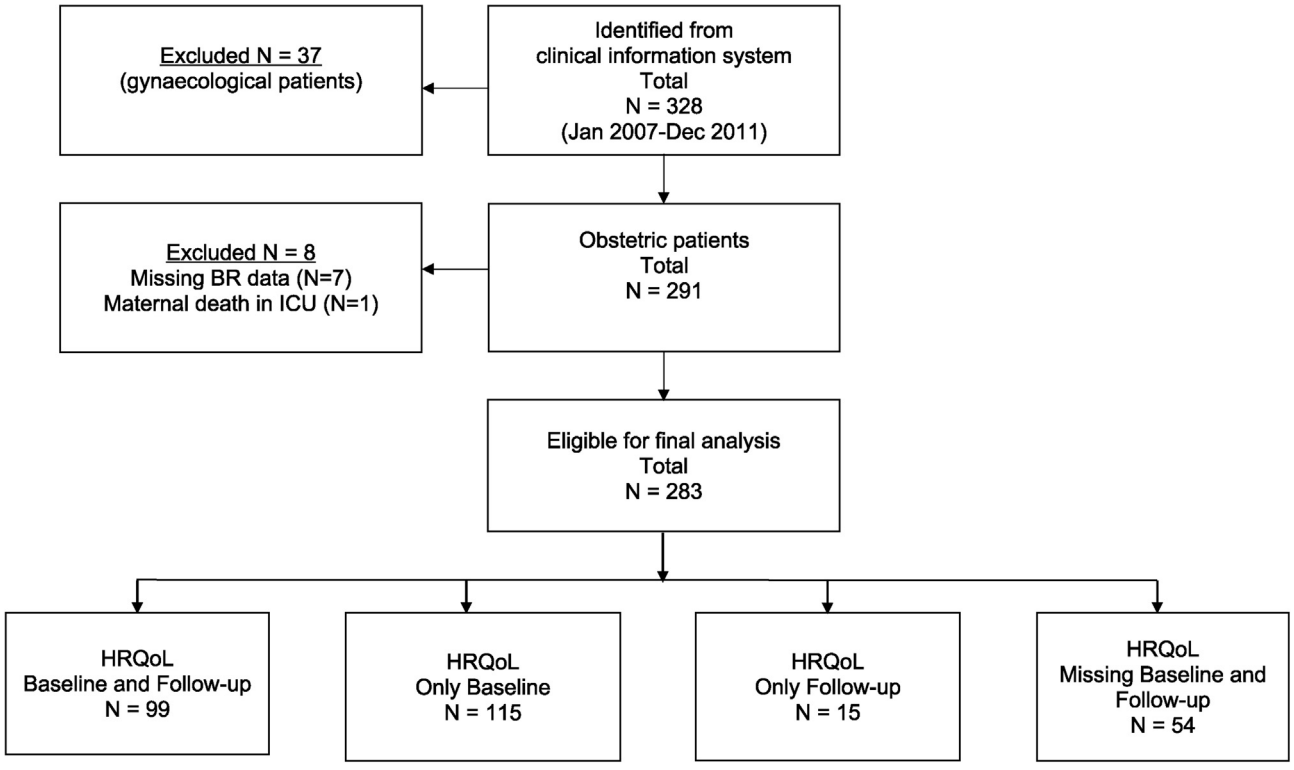

Fig. 1. Patient flowchart. ICU = intensive care unit; BR = birth register, HRQoL = health-related quality of life.

Table 1
Demographic data of obstetric patients and neonatal.

Demographic data	Baseline and follow-up ($n = 99$)	Only baseline ($n = 115$)	Only follow-up ($n = 15$)	Missing ($n = 54$)
	N (%)	*N* (%)	*N* (%)	*N* (%)
Age, years				
<20	0 (–)	1 (0.9)	0 (–)	4 (7.4)
20–35	76 (76.8)	81 (70.4)	14 (93.3)	38 (70.4)
>35	23 (23.2)	33 (28.7)	1 (6.7)	12 (22.2)
Previous deliveries				
0	64 (64.4)	68 (59.1)	7 (46.7)	40 (74.1)
1–2	29 (29.3)	37 (32.2)	7 (46.7)	11 (20.4)
≥3	6 (6.1)	10 (8.7)	1 (6.7)	3 (5.6)
Number of fetuses				
1	90 (90.1)	107 (93.0)	12 (80.0)	52 (96.3)
2	9 (9.1)	8 (7.0)	3 (20.0)	2 (3.7)
Type of delivery				
Vaginal	18 (18.2)	13 (11.3)	3 (20.0)	9 (16.7)
Vacuum extraction	3 (3.0)	7 (6.1)	1 (6.7)	0 (–)
Planned CS[a]	12 (12.1)	13 (11.3)	1 (6.7)	9 (16.7)
Urgent CS[a]	62 (62.6)	68 (59.1)	7 (46.7)	30 (55.6)
Emergency CS[a]	4 (4.0)	14 (12.2)	3 (20.0)	6 (11.1)
Cause of admission				
Hypertensive complications[b]	62 (62.6)	61 (53.0)	7 (46.7)	35 (64.8)
Haemorrhage[c]	20 (20.2)	23 (23.0)	6 (40.0)	9 (16.7)
Other obstetric causes[d]	12 (12.1)	20 (17.4)	1 (6.7)	3 (5.6)
Non-obstetric causes[e]	5 (5.1)	11 (9.6)	1 (6.7)	7 (13.0)
ICU scores median (IQR)				
APACHE II	9.0 (6.0–12.0)	9.5 (7.0–12.0)	9.0 (7.0–16.0)	9.0 (7.0–12.0)
SAPS II	15.0 (10.0–21.0)	14.0 (10.0–21.0)	14.0 (10.0–19.0)	11.5 (10.0–19.0)
SOFA	3.0 (2.0–5.0)	2.0 (1.0–4.0)	3.0 (1.0–6.0)	2.0 (1.0–4.0)
TISS-76 (daily)	20.5 (18.5–25.0)	21.5 (17.5–26.0)	22.5 (20.0–25.5)	21.0 (19.0–24.0)
ICU LOS, hours, median (IQR)	22.0 (16.0–27.0)	21.0 (15.0–28.0)	17.0 (9.0–23.0)	21.0 (17.0–26.0)
Hospital LOS, days, median (IQR)	9.0 (6.0–11.0)	9.0 (6.0–13.0)	7.0 (5.0–13.0)	9.0 (7.25–11.7)
Number of neonatal	*N* = 108 (%)	*N* = 123 (%)	*N* = 18 (%)	*N* = 56 (%)
Gestational age < 37 weeks	62 (57.4)	72 (58.5)	9 (50.0)	37 (66.1)
Birth weight, g				
≥2500	52 (47.2)	53 (42.3)	10 (50.0)	23 (41.1)
<2500	33 (25.0)	39 (32.5)	6 (38.9)	11 (19.6)
<1500	16 (21.3)	14 (11.4)	2 (11.1)	14 (25.0)
<1000	7 (6.5)	17 (13.8)	0 (–)	8 (14.3)
Child at the age of one week				
Home care	45 (41.7)	42 (34.1)	2 (11.1)	19 (33.9)
Post-natal ward	10 (9.3)	11 (8.9)	0 (–)	3 (5.4)
Neonate ward	44 (40.7)	60 (48.8)	16 (88.9)	26 (46.4)
Other hospital	4 (3.7)	5 (4.1)	0 (–)	5 (8.9)
Perinatal mortality[f]	4 (3.7)	5 (4.1)	0 (–)	3 (5.4)

APACHE, Acute Physiology and Chronic Health Evaluation; ICU, intensive care unit; IQR, interquartile range; LOS, length of stay; SAPS, Simplified Acute Physiology Score; SOFA, Sequential Organ Failure Assessment; TISS, Therapeutic Intervention Scoring System.
[a] Caesarean section.
[b] Pre-eclampsia, eclampsia, and hypertension.
[c] Intrapartum or postpartum haemorrhage.
[d] Uterine dysfunctions, rupture, and atony, placental abruption, placenta previa, and delivery-related complications.
[e] Heart diseases, respiratory failure, infection, liver or kidney dysfunctions, and miscellaneous.
[f] Stillbirth or died before the age of one week (0–6 days from delivery or age under 7 days).

during follow-up. Patients with worsened pain/discomfort and patients with worsened anxiety/depression had better HRQoL before ICU admission than at 6 months follow-up (EQsum mean 0.947 vs 0.797 and EQsum mean 0.967 vs 0.756, respectively).

4. Discussion

The present study found that in the majority of the obstetric patients HRQoL was good at baseline and remained so or improved 6 months after intensive care discharge. In addition, more than half of the patients had an increased EQ-VAS score at follow-up, indicating improvement in self-rated health status. However, nearly one-fifth of the patients had impaired HRQoL after discharge. Following intensive care, 15% of the patients indicated having worsened pain/discomfort than before, and 11% had worsened depression/anxiety compared to baseline. Multiparity was a contributing factor to depression/anxiety.

In a heterogeneous obstetric population, pregnancy and childbirth involve factors that may impair physical, mental, and social health status. It is known that sleep disturbance is common in women during pregnancy and has a significant impact on maternal HRQoL.[20–22] Moreover, pregnancy-specific health problems, such as hypertensive disorders or risk for preterm delivery, are associated with decreased HRQoL in pregnancy and postpartum. In previous studies, women who had hypertensive complications experienced more depressive symptoms during pregnancy,[23,24] and in women who suffered from severe preeclampsia, mental health quality of life postpartum was reduced.[25] In addition, caring for an infant with very low birth weight is related to poorer HRQoL among mothers,[25] and neonatal ICU admission and perinatal death are predictive factors for reduced HRQoL.[26]

Impaired HRQoL could be explained by different factors, such as hypertensive complications, delivery emergencies, or care of an infant with LBW. Prick et al.[27] investigated postpartum HRQoL after

Table 2
Number of patients reporting problem levels in EQ-5D domains at baseline and follow-up.

EQ-5D domain	Problems	Baseline	Follow-up	*p*
		N (%)	*N* (%)	
Mobility	No	87 (87.9)	95 (96)	
	Moderate	12 (12.1)	4 (4)	0.021[a]
	Severe	0 (–)	0 (–)	
Self-care	No	97 (98)	98 (99)	
	Moderate	2 (2)	1 (1)	1.000
	Severe	0 (–)	0 (–)	
Usual activities	No	96 (97)	93 (93.9)	
	Moderate	3 (3)	6 (6.1)	0.453
	Severe	0 (–)	0 (–)	
Pain/discomfort	No	75 (75.8)	76 (76.8)	
	Moderate	22 (22.2)	22 (22.2)	0.801
	Severe	2 (2)	1 (1)	
Depression/anxiety	No	88 (88.9)	86 (86.9)	
	Moderate	11 (11.1)	13 (13.1)	0.824
	Severe	0 (–)	0 (–)	

EQ-5D, EuroQol-5D.
[a] McNemar test <0.05.

Table 3
Direction of change in each EQ-5D domain during follow-up ($n = 99$).

EQ-5D domain	Worsened	Same	Improved
	N (%)	*N* (%)	*N* (%)
Mobility	1 (1)	89 (89.9)	9 (9.1)
Self-care	1 (1)	96 (97)	2 (2)
Usual activities	5 (5)	92 (93)	2 (2)
Pain/discomfort	15 (15.5)	68 (68.6)	16 (16.1)
Anxiety/depression	11 (11.1)	79 (79.8)	9 (9.1)

EQ-5D, EuroQol-5D.

Table 4
Summary index (EQsum) and self-rated health state (EQ-VAS) scores at baseline and during follow-up.

Direction of change	EQsum			EQ-VAS		
	N (%)	Baseline	Follow-up	*N* (%)	Baseline	Follow-up
All	99 (100)	0.936	0.940	65 (100)	71.86	88.2[a]
Worsened[b]	19 (19.2)	0.987	0.798	7 (10.7)	87.33	76.85
Same	60 (60.6)	0.970	0.972	21 (32.3)	89.16	87.23
Improved[b]	20 (20.2)	0.788	0.982	37 (57)	56.46	90.89

EQsum, EuroQol-5D instrument with utility score; EQ-VAS, EuroQol-5D instrument with visual analogue scale.
[a] Wilcoxon test <0.001.
[b] A minimum difference of 0.074 in the EQsum, 7 points in the EQ-VAS was considered clinically important.

obstetric complications and found that hypertensive disorders led to lower HRQoL in postpartum women and that CS had the greatest negative impact on postpartum HRQoL. A study by Mautner et al.[23] showed that women who were diagnosed and treated for hypertensive complications and had the risk of preterm delivery experienced more symptoms of depression in pregnancy. In addition, the mode of delivery has been associated with differences in HRQoL after birth. Women who had a vaginal delivery or underwent CS on maternal request were more likely to report better HRQoL than women who had undergone an emergency section.[28] In a study by Turkstra et al.,[29] women who had a highly distressed childbirth had lower HRQoL after 12 months of follow-up. Additionally, these women had more general practitioner visits in their first year after childbirth and were more likely to receive health services, such as referrals to psychological treatment. Mothers of infants with very low birth weight experienced worse physical and mental HRQoL than mothers of infants with normal birth weight; this might be explained by maternal symptoms of stress.[25]

It is notable that the present study reported several hypertensive complications, delivery emergencies, and cases of LBW in neonates, all of which potentially have a negative impact on obstetric patients' HRQoL in the long term, yet multiparity was the only factor that significantly contributed to the experiences of increased depression/anxiety. To deepen the knowledge of the factors associated with poor maternal HRQoL, further studies should compare different populations of pregnant women, including those without critical illness.

In this study, the obstetric patients had a low level of physiological impairment and low severity scores. The patients also had short LOS in ICU. It is possible that for obstetric patients such as these, who do not demonstrate great severity of illness, ICU care may not be the optimum choice and another level of care with appropriate patient monitoring could be considered. In addition, it is assumed that pregnancy in itself may reduce HRQoL. Research has shown that women who are treated, for example, for hypertensive complications or has a risk of preterm delivery have symptoms of depression at the baseline measurement.[23]

Some limitations of this study should be noted. First, 99 patients (35%) of the entire study cohort completed the baseline and follow-up EQ-5D questionnaires, which is a considerably low proportion of all identified patients. This might be due to the fact that the analysed data were retrieved from clinical information systems and secondary data were initially collected for other purposes. Thus, the accumulation of data could not be influenced during the study period. The low response has potentially biased the results for some measures.

Second, baseline measurement was performed during the ICU stay when the patient was already affected by a decline in health, and some of the patients may have been in the antenatal ward because of a complication before admission to ICU. Furthermore, the end of pregnancy may be associated with mobility changes that are unrelated to acute illness and need for recovery in ICU. It should be also noted that the EQ-5D is not intended to be used retrospectively. These factors may have had an effect on how the patient estimated her baseline health status, and these points create uncertainty in the baseline results. However, the EQ-5D instrument has been developed further to include five levels instead of three to make the health measurement more sensitive. We suggest that in future studies the five-level scales should be used.

Finally, in this study, we were not able to control for confounders and no comparison with non-ICU–admitted pregnant population was performed. Therefore, it was unable to draw any conclusion. In future studies, it is important to extend the investigation to confounders and comparisons for women of child-bearing age. However, the advantages of using secondary data were that it was already available; the data provided a long observational period and covered the whole study population. In addition, register-based studies make it feasible to study rare phenomena, such as ICU-admitted patient.

5. Conclusion

In the majority of the obstetric patients who had good HRQoL before intensive care, HRQoL was similarly good or had increased at 6 months' follow-up after intensive care. However, nearly one-fifth of the patients had impaired HRQoL after discharge. Further study is needed to better understand the impact of ICU admission associated with childbirth on HRQoL. However, it would appear that intensive care management should take into consideration a follow-up program after intensive care of ICU-admitted obstetric patients.

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