Original Article

Postpartum Hemorrhage in a High Birth Rate Region: Epidemiological Analysis and Evaluation of Clinical Practice

Damira E. Ibrayeva[1] Almagul' M. Kurmanova[2] Raushan G. Nurkhasimova[3] Ardak K. Ayazbekov[4] Dinara D. Mirzakhmetova[5] Saltanat N. Kulbayeva[6] Nursultan N, Nazarbayev[7] Alfiya Y. Dzheksembekova[8] Karlygash N. Tazhibayeva[9] Assel D. Sadykova[10]

ABSTRACT

Aim

Postpartum hemorrhage (PPH) is a frequent complication in obstetric practice and a leading cause of maternal mortality, especially in high-birth-rate countries. Many women who survive such hemorrhages lose their reproductive potential due to radical surgeries such as hysterectomy.

Objective

To assess the prevalence, causes, treatment methods, and outcomes of massive postpartum hemorrhage in a high-birth-rate region.

Materials and Methods

A retrospective analysis of 287 cases of postpartum hemorrhage over a 5-year period (from January 1, 2018 to December 31, 2022) was conducted. All PPH cases were divided into two groups and compared by perinatal and obstetric risk factors in the Turkestan region of Kazakhstan. The frequency and prevalence of PPH, predisposing risk factors, perinatal complications, and extragenital diseases were assessed. Methods of managing postpartum hemorrhage were evaluated.

Results

The incidence of postpartum hemorrhage was 6 per 1,000 births, and the rate of massive transfusions was 13 per 10,000 births in the high-birth-rate region of Turkestan. The main causes were uterine atony (71.8%) and placental pathology (20.2%). Oxytocin was administered in 95.5% of cases, misoprostol in 37.9%, and tranexamic acid in 32.4%. The B-Lynch suture was the most common surgical method (32.8%), mostly in cases of uterine atony. Hysterectomy was performed in only 4.9% of cases, and in 71.4% of them the cause was uterine atony (rarely placental pathology or abruption).

Conclusions

Among 287 women with PPH, 62 (21.6%) had adverse maternal outcomes; of these, 14 (22.6%) underwent hysterectomy. In 88.7% of adverse outcomes, two or more predisposing factors were present. The use of organ-preserving procedures such as B-Lynch sutures, O'Leary uterine artery ligation, and temporary compression sutures reduced the hysterectomy rate by fourfold.

KEYWORDS

postpartum hemorrhage; massive transfusion; cesarean section; hysterectomy; maternal near miss.

INTRODUCTION

Severe (massive) postpartum hemorrhage (PPH) is the leading cause of maternal mortality (27%) and severe maternal morbidity worldwide[1,2]. PPH is associated with hemorrhagic shock, disseminated intravascular coagulation, severe anemia, multi-organ failure, Sheehan's syndrome, and hysterectomy[5]

Recent efforts to better identify at-risk patients, define significant blood loss, quantitatively

1. Damira E. Ibrayeva, Khoja Akhmet Yassawi International Kazakh-Turkish University, Kazakhstan. Scopus ID 57209139210
2. Almagul' M. Kurmanova, Al-Farabi Kazakh National University, Republic of Kazakhstan, Scopus ID 56896046600
3. Raushan G. Nurkhasimova, Khoja Akhmet Yassawi International Kazakh-Turkish University, Kazakhstan and Regional Perinatal Center No. 3, Turkistan, Kazakhstan, Scopus ID 57191964483
4. Ardak K. Ayazbekov, Khoja Akhmet Yassawi International Kazakh-Turkish University, Kazakhstan and Regional Perinatal Center No. 3, Turkistan, Kazakhstan. Scopus ID 57209135700
5. Dinara D. Mirzakhmetova, Khoja Akhmet Yassawi International Kazakh-Turkish University, Kazakhstan. Scopus ID 57216767754
6. Saltanat N. Kulbayeva, South Kazakhstan Medical Academy, Kazakhstan. Scopus ID 56127768600
7. Nursultan N, Nazarbayev, Khoja Akhmet Yassawi International Kazakh-Turkish University, Kazakhstan.
8. Alfiya Y. Dzheksembekova, Al-Farabi Kazakh National University, Republic of Kazakhstan.
9. Karlygash N. Tazhibayeva, Al-Farabi Kazakh National University, Republic of Kazakhstan and Almaty Regional Multidisciplinary Clinic, Scopus ID 57914882300
10. Assel D. Sadykova, Al-Farabi Kazakh National University, Republic of Kazakhstan and Republican blood center" of the Ministry of health of the Republic of Kazakhstan. Scopus ID 57045813900

Correspondence
Assel Sadykova, Al-Farabi Kazakh National University, Republic of Kazakhstan and Republican blood center" of the Ministry of health of the Republic of Kazakhstan.

Bangladesh Journal of Medical Science Vol. 24 No. 04 October'25

DOI: https://doi.org/10.3329/bjms.v24i4.84689

measure hemorrhage, and standardize perinatal care have increased the preventability of PPH[5]. In the Turkestan region, the PPH rate decreased threefold from 11.3 to 3.6 per 1,000 births between 2018 and 2022. Nevertheless, the prevalence of peripartum hysterectomy in Kazakhstan is 1.93 per 1,000 births, with the highest rates reported in the high-birth-rate region of Turkestan (20.2%), followed by the Almaty region (12.8%) and Almaty city (10.3%)[6-8]

About 2–4% of PPH cases are caused by uterine atony in the third stage or postpartum period, while 1% are due to placental abruption or placenta previa. Addressing PPH requires a multifaceted approach focused on prevention, risk response, rapid access to emergency care, and effective knowledge transfer[10].

The WHO Postpartum Hemorrhage Roadmap (2023–2030) outlines priority actions, including the development of updated guidelines covering prevention, identification, and treatment; research to promote innovation and scale up access to proven interventions; and improvement of facility-based care at the national level.

Previously established risk factors for PPH include advanced maternal age, macrosomia, obesity, hypertensive disorders, history of PPH, labor induction, placenta anomalies, multiple pregnancies, and cesarean delivery[12]. Prediction tools such as the California Maternal Quality Care Collaborative (CMCQQ), AWHONN, and NYBOH bundles have been suggested. However, risk factor definitions vary among studies, partly due to differing definitions of blood loss thresholds[14,15,17].

A differentiated approach is needed to identify PPH risk factors based on blood loss volume, enabling better antenatal preparation and the prevention of avoidable maternal morbidity and mortality[18,19].

The objective of this study was to assess risk factors, labor and postpartum course, and clinical management of women with postpartum hemorrhage depending on the volume of blood loss in a high-birth-rate region.

MATERIALS AND METHODS

The study was approved by the Local Ethics Committee of the Kazakh Medical University of Continuing Education (Protocol No. 3 dated 17.03.2020).

A retrospective cohort study was conducted at Regional Perinatal Center No. 3 in the Turkestan region. This is a tertiary-level maternity hospital located in a high-birth-rate region of Kazakhstan, equipped with a blood bank, delivery unit, obstetric pathology ward, surgery department, and intensive care units [20, 21].

From January 1, 2018 to December 31, 2022, a total of 46,554 deliveries were registered, and 287 cases (0.6%) involved postpartum hemorrhage. Based on blood loss volume, patients were divided into two groups: Group 1 (n=169, 58.9%) had blood loss up to 1000 mL, and Group 2 (n=118, 41.1%) had blood loss exceeding 1000 mL.

Inclusion criteria: women with PPH. According to national clinical guidelines, PPH is defined as ≥500 mL blood loss during vaginal delivery, ≥1000 mL during cesarean section, or lesser volumes causing hemodynamic instability within 42 days postpartum.

Adverse outcomes were defined as cases requiring ≥3 units of red blood cell transfusion, hysterectomy, or internal iliac artery ligation. Blood loss was measured using graduated containers and weighing soaked materials (1 g = 1 mL) [22].

Data were collected via a custom Excel form and included demographic data (residence, age), risk factors, obstetric history, comorbidities, course of pregnancy and delivery, lab values, and treatment methods.

Statistical analysis was conducted using IBM SPSS Statistics v23.0. Descriptive statistics were expressed as frequencies and percentages for categorical variables and as means ± standard deviation (SD) for normally distributed continuous variables. For skewed data, medians and interquartile ranges (IQR) were used.

Chi-square tests were used to compare groups by blood loss volume. Associations between maternal/obstetric factors and adverse outcomes were examined using cross-tabulations (χ^2) and multivariate logistic regression. Adjusted odds ratios (ORs) with 95% confidence intervals (CIs) were calculated, adjusting for antenatal risk factors. Pearson correlation coefficients ≤0.3 were interpreted as weak, indicating no significant collinearity [23].

Relative risks (RRs) were calculated to assess the likelihood of surgical interventions based on the cause of PPH (e.g., uterine atony, placental pathology, abruption).

Ethical clearence

This study was conducted in accordance with ethical

standards. Ethical approval was obtained from the appropriate institutional review board, and informed consent was secured from all participants prior to data collection.

RESULTS

The comparative characteristics of the parturients are presented in Table 1-3.

Table 1. Characteristics of parturients with postpartum hemorrhage (PPH)

Indicator	Total, n=287	Group 1 n=169	Group 2 n=118	p-value
Age at delivery (years)				
18-28	118 (41.1%)	80 (47.3%)	38 (32.2%)	0.0285*
29-39	147 (51.2%)	79 (46.7%)	68 (57.6%)	
≥40	22 (7.7%)	10 (6%)	12 (10.2%)	
BMI				
18.5-24	87 (30.3%)	56 (33.1%)	31 (26.3%)	0.2698
25-30	121 (42.1%)	71 (42%)	50 (42.4%)	
≥30	54 (18.9%)	26 (15.4%)	28 (23.7%)	
Data missing	25 (8.7%)	16 (9.5%)	9 (7.6%)	
Parity				
0	61 (21.3%)	40 (23.7%)	21 (17.8%)	0.3264
1-3	154 (53.6%)	91 (53.8%)	63 (53.4%)	
≥4	72 (25.1%)	38 (22.5%)	34 (28.8%)	
Gestational age				
21-28 weeks	2 (0.7%)	1 (0.6%)	1 (0.8%)	0.047*
29-36 weeks	23 (8.1%)	8 (4.7%)	15 (12.7%)	
Full-term (≥37 weeks)	262 (91.2%)	160 (94.7%)	102 (86.5%)	

Note: Differences are significant between groups at $p<0.05$.

Table 2. Anamnestic data of women with postpartum hemorrhage (PPH)

Indicator	Total, n=287	Group 1 n=169	Group 2 n=118	p-value
Living conditions and admission				
City	170 (59.2%)	96 (56.8%)	74 (62.7%)	0.3286
Village	117 (40.8%)	73 (43.2%)	44 (37.3%)	
Planned admission	65 (22.6%)	37 (21.9%)	28 (23.7%)	0.712

Indicator	Total, n=287	Group 1 n=169	Group 2 n=118	p-value
Emergency admission	222 (77.3%)	132 (78.1%)	90 (76.3%)	
Maternal risk factors				
Primigravida	61 (21.3%)	40 (23.7%)	21 (17.8%)	0.231
Parity ≥4	72 (25.1%)	38 (22.5%)	34 (28.8%)	0.221
Uterine fibroids	20 (6.9%)	9 (5.3%)	11 (9.3%)	0.19
Risk factors from the medical history				
Obstetric risks				
Miscarriage	95 (33.1%)	63 (37.3%)	32 (27.1%)	0.0945
PPH in medical history	67 (23.3%)	28 (16.6%)	39 (33.1%)	0.0019
Cesarean section in medical history	30 (10.5%)	9 (5.3%)	21 (17.8%)	0.0014
Extragenital diseases				
Iron deficiency anemia	237 (82.6%)	132 (78.1%)	105 (89%)	0.0256
Liver diseases	26 (9.0%)	14 (8.3%)	12 (10.2%)	0.7349
Kidney diseases	55 (19.1%)	23 (13.6%)	32 (27.1%)	0.0068
Diabetes mellitus	24 (8.3%)	9 (5.3%)	15 (12.7%)	0.0447
Hypertension	17 (5.9%)	5 (2.95%)	12 (10.2%)	0.0219
Thrombocytopenia	10 (3.5%)	8 (4.7%)	2 (1.7%)	0.2918
Pregnancy and delivery-related risk factors				
Polyhydramnios	21 (7.3%)	9 (5.3%)	12 (10.2%)	0.1868
Macrosomia	93 (32.4%)	54 (31.95%)	39 (33.05%)	0.9462
Multiple pregnancy	18 (6.3%)	6 (3.6%)	12 (10.2%)	0.0425
Pregnancy-induced hypertension	42 (14.6%)	16 (9.5%)	26 (22.03%)	0.0052
Preeclampsia, eclampsia	36 (12.5%)	12 (7.1%)	24 (20.3%)	0.0016
Chorioamnionitis	8 (2.8%)	2 (1.2%)	6 (5.1%)	0.1071
Prolonged labor	67 (23.3%)	45 (26.6%)	22 (18.6%)	0.1523
Induction	59 (20.5%)	39 (23.07%)	20 (16.9%)	0.2646
Oxytocin stimulation	82 (28.6%)	51 (30.2%)	31 (26.3%)	0.5565
Cesarean section during current delivery	21 (7.3%)	-	21 (17.8%)	0.0000
Magnesium therapy	89 (31%)	50 (29.6%)	39 (33.1%)	0.6208

Table 3. Primary causes of postpartum hemorrhage

Indicator	Total, n=287	Group 1 n=169	Group 2 n=118	p-value
Placental pathologies				
Placental retention	58 (20.2%)	31 (18.4%)	27 (22.9%)	0.1212
Placental previa	2 (0.7%)	-	2 (1.7%)	>0.05 (≈0.50+)
Placental abruption	8 (2.8%)	2 (1.15%)	6 (5%)	≈0.25–0.30
Other causes				
Uterine atony	206 (71.8%)	131 (77.5%)	75 (63.6%)	0.1293
Perineal trauma, birth canal injury	13 (4.5%)	5 (2.95%)	8 (6.8%)	>0.4

Table 4. Obstetric outcomes of women with postpartum hemorrhage (PPH)

Indicator	Total, n=287	Group 1 n=169	Group 2 n=118	p-value
Mode of delivery				
Spontaneous vaginal delivery	198 (68.9%)	125 (73.96%)	73 (61.9%)	0.0000
Instrumental delivery (induction)	68 (23.7%)	44 (26.04%)	24 (20.3%)	
Cesarean section	21 (7.4%)	0	21 (17.8%)	
Maternal outcome				
Maternal mortality	0	0	0	0.0000
Unfavorable	62 (21.6%)	1 (0.6%)	61 (51.7%)	
Favorable	225 (78.4%)	168 (99.4%)	57 (48.3%)	
Neonatal outcome				
Live births	283 (98.6%)	169 (100%)	114 (96.6%)	0.0576
Stillbirths	4 (1.4%)	-	4 (3.4%)	
Neonatal mortality	0	-	-	
Data missing	0	-	-	

In the comparative analysis, the most likely risk factors for massive blood loss (more than 1000 ml) among parturients with the following characteristics: age over 29 years, history of postpartum hemorrhage (PPH), previous cesarean section, history of iron deficiency anemia, kidney diseases, diabetes mellitus, hypertension, pregnancy-induced hypertension, multiple pregnancy, preeclampsia; gestational age less than 36 weeks, cesarean section during the current delivery[24,25,26].

Table 5. Interventions in the management of postpartum hemorrhage (PPH) by causes

Intervention	Atony	Placental Abnormalities	Uterine Rupture	Total (n = 287), %	Atony Binary	RR
Oxytocin	206 (75.2%)	60 (21.9%)	8 (2.9%)	274 (95.5%)	1	1.05
Misoprostol	86 (78.9%)	17 (15.6%)	6 (5.5%)	109 (37.9%)	1	1.10
Tranexamic acid	68 (73.2%)	19 (20.4%)	6 (6.4%)	93 (32.4%)	1	1.01

Intervention	Atony	Placental Abnormalities	Uterine Rupture	Total (n = 287), %	Atony Binary	RR
Relaparotomy	6 (75.0%)	0	2 (25%)	8 (2.8%)	1	1.03
Hysterectomy	10 (71.4%)	1 (7.14%)	3 (21.4%)	14 (4.9%)	0	0.98
Removal of placental remnants	0	53 (100%)	0	53 (18.5%)	1	0.00
Abdominal aortic compression	65 (81.2%)	15 (18.8%)	0	80 (27.9%)	1	1.13
Temporary arterial ligation	17 (70.8%)	6 (25%)	1 (4.2%)	24 (8.4%)	1	0.97
B-Lynch sutures	75 (79.7%)	15 (15.9%)	4 (4.2%)	94 (32.8%)	1	1.11
O'Leary artery ligation	56 (78.8%)	11 (15.5%)	4 (5.6%)	71 (24.7%)	1	1.09
PVA (pulsatile volume expansion)	10 (71.4%)	1 (7.14%)	3 (21.4%)	14 (4.9%)	1	0.98
Uterine rupture repair	3 (100%)	0	0	3 (1.05%)	1	1.38
Uterine inversion	1 (100%)	0	0	1 (0.35%)	1	1.38
Blood transfusion	84 (84%)	15 (15%)	1 (1%)	100 (34.8%)	1	1.17
Massive blood transfusion	44 (70.9%)	12 (19.3%)	6 (9.6%)	62 (21.6%)	1	0.97
Transfer to ICU	53 (67.9%)	17 (21.8%)	8 (10.2%)	78 (27.2%)	1	0.93

[1]: Bleeding not associated with birth canal trauma

[2]: Refers to placental retention, placental previa, and placental accretion

Table 5 presents the frequency of various diagnostic and therapeutic interventions for massive postpartum hemorrhage (PPH) depending on its causes (uterine atony, placental pathology, uterine rupture). Medications were most frequently used, with oxytocin administered in 274 cases (95.5% of all PPH), misoprostol in 109 cases (37.9%), and tranexamic acid in 93 cases (32.4%). The majority of these interventions were performed mainly for uterine atony: oxytocin was administered in 75.2% of uterine atony cases and only in 2.9% of uterine rupture cases. Among surgical methods, the most common was the B-Lynch suture (94 cases, 32.8%), also predominantly for atonic hemorrhage. Hysterectomy was performed in only 14 cases (4.9%), with the majority (71.4%) done for uterine atony (and only in rare cases for placental pathology or uterine rupture). The frequency of emergency laparotomy for uterine cavity revision was very low (2.8%), reflecting a tendency toward maximal conservatism in the management of PPH. Notably, the removal of placental remnants was performed only for "placental" causes (53 cases, 100% of uterine rupture cases) and was absent in atonic hemorrhage (RR = 0)[27].

The obtained data highlight the typical approach to managing PPH: pharmacological agents and organ-preserving surgeries (B-Lynch, O'Leary sutures, aortic compression) are most commonly used as the first line. The relative risks (column RR) are close to one for most methods, indicating equal use of interventions for different causes of PPH. The exception is the removal of the placenta (RR = 0 for uterine atony), reflecting the specificity of this method for placental pathology. It is important to note that about one-third of patients (34.8%) received blood component transfusions, and over 20% of women required massive blood transfusions and transfer to the intensive care unit, underscoring the severity of the clinical cases.

Thus, Table 6 demonstrates that most patients with PPH received adequate intensive therapy, with the distribution of interventions correlating with the presumed etiological factor of bleeding (e.g., placental interventions exclusively for placental pathology).

Table 6. Multivariate logistic regression of risk factors associated with adverse outcomes

Risk Factor	Adverse Outcome (n=62)	Favorable Outcome (n=225)	p-value	Chi-square	OR	95% CI
Antenatal period						
BMI ≥30	17 (27.4%)	37 (16.4%)	0.03	4.56	2.5	1.1–5.4
Age ≥40	4 (6.5%)	18 (8%)	0.05	3.89	2.1	0.9–4.8
Primigravida	7 (11.3%)	54 (24%)	0.01	6.21	3.2	1.4–7.2
Parity ≥4	20 (32.3%)	52 (23.1%)	0.04	4.21	1.9	1.0–3.9
Previous cesarean section	14 (22.6%)	16 (7.1%)	0.01	10.83	3.81	1.7–8.3
PPH in medical history	25 (40.3%)	42 (18.6%)	0.0007	11.56	2.94	1.6–5.4
Hypertension						
Hypertension	23 (37.1%)	72 (32%)	0.5467	0.36	1.25	1.7–2.3
Anemia						
Anemia	57 (91.9%)	180 (80%)	0.045	4.02	2.85	1.1–7.5
Thrombocytopenia						
Thrombocytopenia	2 (3.2%)	8 (3.5%)	1.0	0.0	0.9	0.2–4.4
Macrosomia						
Macrosomia	18 (29%)	75 (33.3%)	0.6259	0.24	0.82	0.4–1.5
Multiple pregnancy						
Multiple pregnancy	4 (6.4%)	14 (6.2%)	1.0	0.0	1.04	0.3–3.3
Labor-related processes						
Chorioamnionitis	3 (4.8%)	5 (2.2%)	0.5013	0.45	2.24	0.5–9.6
Prolonged labor	10 (16.1%)	57 (25.3%)	0.1778	1.82	0.57	0.3–1.2
Induction	12 (19.4%)	47 (20.9%)	0.9305	0.01	0.91	0.4–1.8
Oxytocin stimulation	18 (29%)	64 (28.4%)	1.0	0.0	1.03	0.6–1.9
Cesarean section	18 (29%)	3 (1.3%)	0.0	50.98	30.27	8.5–107.2

DISCUSSION

Risk factors that predispose women to postpartum hemorrhage (PPH) play a crucial role in its development. When reviewing cases with poor outcomes (n=62), it was striking that only one woman had no identifiable risk factors. The vast majority—55 women (88.7%)—had two or more. In fact, three women presented with as many as seven different risk factors, drawn from both their medical history and complications during labor. Eight women (13%) had six risk factors, 13 women (21%) had five, and 12 women (19%) had four.

The most frequently observed contributors included anemia, a history of previous PPH, obesity, high parity, hypertension, fetal macrosomia, a past cesarean section, and cesarean delivery in the current pregnancy. These findings highlight that women who experience severe PPH often face complex medical backgrounds and difficult childbirths, making early recognition of risk especially important.

Multivariate logistic regression (Table 6) revealed a number of factors statistically significantly associated with adverse outcomes in women with PPH. For

example, obesity (BMI ≥30) more than doubled the risk of worsening condition (adjusted OR ≈ 2.5; 95% CI 1.1–5.4; p=0.03). Obstetric factors were also significant: primigravida (OR ≈ 3.2; 95% CI 1.4–7.2; p=0.01) and high parity (≥4 pregnancies; OR ≈ 1.9; 95% CI 1.0–3.9; p=0.04). The presence of obstetric interventions in the history also substantially influenced the risk: a previous cesarean section was associated with nearly a fourfold increase in the likelihood of an adverse outcome (OR ≈ 3.81; 95% CI 1.7–8.3; p=0.01), and a history of previous PPH was associated with almost a threefold increase (OR ≈ 2.94; 95% CI 1.6–5.4; p<0.001). A risk factor was also anemia: anemia during pregnancy was associated with an increased likelihood of deterioration (OR ≈ 2.85; 95% CI 1.1–7.5; p=0.045)[28, 29].

Among other examined factors, age ≥40 years and the presence of hypertensive complications during pregnancy did not show a statistically significant relationship with adverse outcomes (p>0.05). The influence of the specifics of the current delivery was particularly noteworthy: cesarean section in the current pregnancy had an extraordinarily high risk of worsening (adjusted OR ≈ 50.98; 95% CI 8.5–107.2; p<0.001). It should be noted that the wide confidence interval for this factor's OR suggests significant data variability (possibly due to the low number of such cases), but the lower limit is significantly above one, highlighting its serious prognostic significance[30,31].

Overall, the results from Table 6 clearly identify key predictors of severe outcomes in PPH and emphasize the need for especially careful monitoring of patients with identified risk factors.

CONCLUSION

The assessment of postpartum hemorrhage with an adverse maternal outcome in our study showed that a key component in managing pregnancies and deliveries is taking a detailed medical history and accounting for predisposing risk factors. Adequate dynamic monitoring of women during labor and identifying pathologies at an early stage provides an optimally effective opportunity to stop the bleeding.

Conflict of Interest: The authors declare no conflict of interest.

Authors's contribution:

Data gathering and idea owner of this study: *Damira E. Ibrayeva, Almagul' M. Kurmanova*

Study design: *Raushan G. Nurkhasimova, Ardak K. Ayazbekov*

Data gathering: *Dinara D. Mirzakhmetova*, *Saltanat N. Kulbayeva*

Writing and submitting manuscript: *Nursultan N, Nazarbayev*, *Assel D. Sadykova*

Editing and approval of final draft: *Alfiya Y. Dzheksembekova, Karlygash N. Tazhibayeva*

REFERENCES

1. Say L., Chou D., Gemmill A., et al. Global causes of maternal death: a WHO systematic analysis. *Lancet Glob Health*. 2014; **2**(6): e323–33.
2. Souza J.P., Gulmezoglu A.M., Vogel J., et al. Moving beyond essential interventions for reduction of maternal mortality (the WHO multicountry survey on maternal and newborn health): a cross-sectional study. *Lancet*. 2013; **381**(9879): 1747–55.
3. Ayazbekov A.K., Ayazbekova A.B., Nurhasimova R.G., Kurmanova A.M. Dynamics of postpartum hemorrhages in a third-level obstetric facility. *Phthisiopulmonology*. 2024; **3**(45): 5-11.
4. Sentilhes L., Gromez A., Clavier E., Resch B., Descamps P., Marpeau L. Long-term psychological impact of severe postpartum hemorrhage. *Acta Obstet Gynecol Scand*. 2011; **90**(6): 615–20.
5. Libretti A., Savasta F., Nicosia A., et al. Exploring the Father's Role in Determining Neonatal Birth Weight: A Narrative. *Medicina (Kaunas)*. 2024 Oct; **60**(10): PubMed ID: 39459447.
6. Royal College of Obstetricians and Gynaecologists. Postpartum Haemorrhage, Prevention and Management (Green-top Guideline No. 52). London: *RCOG*; 2016.
7. Royal College of Obstetricians and Gynaecologists. Antepartum Haemorrhage (Green-top Guideline No. 63). London: *RCOG*; 2011.
8. Antepartum risk factors and outcomes of massive transfusion for elective cesarean section: a nationwide retrospective cohort study. *MC Pregnancy Childbirth* 2024 Oct; **24**(1): 699. PubMed ID: 39448931.
9. Maswime S., Buchmann E. A systematic review of maternal near miss and mortality due to postpartum hemorrhage. *Int J Gynaecol Obstet*. 2017; **137**(1): 1–7.
10. Chatfield M.J., Woods L., Sussock E., et al. Early pregnancy high normal HbA1c: a high-risk group? *N Z Med J*. 2024 Oct; **137**(1604): 13–21. PubMed ID: 39418601.
11. Song Q., Jia J., Chen C., Li G. Acute Kidney Injury in Critically Ill Pregnant Women: A Retrospective Study on Risk Factors and Outcomes. *Iran J Kidney Dis*. 2024 Aug; **18**(4): 195–203. PubMed ID: 39423093.
12. Begum, T., & Reza, F. (2021). Auditory Cognitive Function

Assessment during Pregnancy: An Event-Related Potential and Neuropsychological Study. *Bangladesh Journal of Medical Science*, **20**(3): 608–617. https://doi.org/10.3329/bjms.v20i3.52803

13. United Nations Department of Economic and Social Affairs. The Sustainable Development Goals Report 2016.
14. World Health Organization. Evaluating the quality of care for severe pregnancy complications: the WHO near-miss approach for maternal health. 2011.
15. Alemie A.A., Siraj E.A., Wondie G.B., et al. Post-marketing quality evaluation of oxytocin injection and assessment of associated factors among selected health facilities in Addis Ababa, Ethiopia. *Sci Rep*. 2024 Oct; **14**(1): 24243. PubMed ID: 39414892.
16. Hu H., Wang L., Gao J., et al. Risk factors of severe postpartum hemorrhage in pregnant women with placenta previa or low-lying placenta: a retrospective cohort study. *BMC Pregnancy Childbirth*. 2024 Oct; **24**(1): 674. PubMed ID: 39407169.
17. Huang A.K., Schulte A.R., Hall M.E., et al. Mapping the scientific literature on obstetric and perinatal health among sexual and gender minoritized (SGM) childbearing people and their infants: a scoping review. *BMC Pregnancy Childbirth*. 2024 Oct; **24**(1): 666. PubMed ID: 39395977.
18. Luiz C.B., Müller A.L.L., Salazar C.C., et al. Multidisciplinary team training in postpartum hemorrhage: impact on the use of blood products. *Rev Bras Ginecol Obstet*. 2024; 46. PubMed ID: 39380585.
19. Zhou P., Guo X. Comparison of maternal and neonatal outcomes between vaginal birth after cesarean section and normal vaginal birth. *J Matern Fetal Neonatal Med*. 2024 Dec; **37**(1): 2399942. PubMed ID: 39375050.
20. Abdulsalam F.A.M., Bourdakos N.E., Burns J.W\.F., et al. Twin pregnancy and postpartum haemorrhage: a systematic review and meta-analysis. *BMC Pregnancy Childbirth.* 2024 Oct; **24**(1): 649. PubMed ID: 39367324.
21. Sadykova A., Shalkharova Z.S., Shalkharova Z.N., Sadykova K., Madenbay K., Zhunissova M., Nuskabayeva G., Saltanat Askarova, Grjibovski A.M. Metabolic syndrome and its components in southern Kazakhstan: A cross-sectional study. *International Health*, 2018; **10** (4), pp. 268-276.
22. Sadykova A.D., Shalkharova Zh.S., Shalkharova Zh.N., Ibragimova S.I., Ibragimova D.K., Saruarov E.G., Sharabitdinova G.G., Mamraimova D.N., Ivanov S.V., Grjibovski A.M. Assessment of the role of selected comorbidities on overall - and cardiovascular mortality in Southern Kazakhstan: A 12-years follow-up study. *Human Ecology (Russian Federation)*, 2016;**11**: pp. 42-49.
23. Sadykova, K.Zh., Shalkharova, Zh.S., Shalkharova, Zh.N., Sadykova, A.D., Nuskabayeva, G.O., Zhunissova, M.B., Madenbay, K.M., Grjibovski, A.M. Prevalence of anemia, its socio-demographic determinants and potential association with metabolic syndrome in residents of Turkestan, Southern Kazakhstan. *Human Ecology (Russian Federation)* 2015;**8**:pp. 58–64
24. Shynar Kulbayeva, Karlygash Tazhibayeva, Laura Seiduanova, Indira Smagulova, Aiman Mussina, Shynar Tanabayeva, Ildar Fakhradiyev, Timur Saliev. The Recent Advances of Mobile Healthcare in Cardiology Practice. *Acta Inform Med*. 2022 Sep; **30**(3): 236–250. doi: 10.5455/aim.2022.30.236-250.
25. Buleshov M. A, Zhanabaev N.S., Tazhibayeva K.N., Omarova B.A., Buleshova A.M., Botabayeva R.E., Buleshov D.M., Ivanov S.V., Grzhibovsky A.M. (2017). The use of international criteria for assessing the physical development of first graders in the South Kazakhstan region of the Republic of Kazakhstan. *Human ecology* - No. 2. -S. 32-38. DOI: 6 (574.5)
26. Tazhibayeva K.N. Buleshov M.A., Zhanabaev N.S., Buleshov A.M., Buleshov D.M., Ivanov S.V., Grzhibovsky A.M. 616-006.6-039.57 (574.5) Assessment of the quality of medical care for patients with oncological diseases in outpatient clinics of the South Kazakhstan region of the Republic of Kazakhstan. *Human ecology*. – 2017;**3**: - S. 43-49. DOI: 616-006.6-039.57
27. Shafiq Ahamd Joya; Kurmanova Gaukhar Medeubaevna; Sadykova Assel Dauletbayevna; Tazhibayeva Karlygash Nartbayevna; Bosatbekov Erkebulan Nurlanovich; Muratbekova Raikhan Abdurazakovna. Liver manifestation associated with COVID-19 (Literature review). Revista Latinoamericana de Hipertensión. 2021;**16**:
28. Akbulut AC, Arisz RA, Baaten CCFMJ, Baidildinova G, Barakzie A, Bauersachs R, Ten Berg J, van den Broek WWA, de Boer HC, Bonifay A, Bröker V, Buka RJ, Ten Cate H, Ten Cate-Hoek AJ, Cointe S, De Luca C, De Simone I, Diaz RV, Dignat-George F, Freson K, Gazzaniga G, van Gorp ECM, Habibi A, Henskens YMC, Iding AFJ, Khan A, Koenderink GH, Konkoth A, Lacroix R, Lahiri T, Lam W, Lamerton RE, Lorusso R, Luo Q, Maas C, McCarty OJT, van der Meijden PEJ, Meijers JCM, Mohapatra AK, Nevo N, Robles AP, Poncelet P, Reinhardt C, Ruf W, Saraswat R, Schönichen C, Schutgens R, Simioni P, Spada S, Spronk HMH, Tazhibayeva K, Thachil J, Diaz RV, Vallier L, Veninga A, Verhamme P, Visser C, Watson SP, Wenzel P, Willems RAL, Willers A, Zhang P, Zifkos K, van Zonneveld AJ. Blood Coagulation and Beyond: Position Paper from the Fourth Maastricht Consensus Conference on Thrombosis. *Thromb Haemost*. 2023 Aug;**123**(8):808-839. doi: 10.1055/a-2052-9175. Epub 2023 Mar 13. PMID: 36913975; PMCID: PMC10365887.
29. Kulbayeva Shynar, Seiduanova Laura, Berdesheva Gulshara, Suleimenova Roza, Sadykova Assel, Yerdenova, M. Cardiovascular Diseases Increased among the Rural and Urban Population of the Northern Regions of the Republic of Kazakhstan during COVID-19: A Descriptive Study with Forecasting. *Reviews in Cardiovascular Medicine,* 2024; **25**(3)
30. Abdigapparkyzy, O.S., Zhaksybayevna, N.O., Sadykova, A., Tazhibayeva, K., Moldir, A., Kemelbekov, K., Baimakhanova, B., Darhan, A., Elmira, B. Scientific Justification of A Personalized Approach To The Management of Patients with Terminal Renal Failure. *Bangladesh Journal of Medical Science*, 2024; **23**(3): p. 851–863
31. Assel Sadykova, Karlygash Tazhibayeva, Aiman Mussina, Farida Amirseitova, Zinat Abdrakhmanova, Maria Anartaeva, Gulzada Nurgaliyeva, Shynar Otynshiyeva. Comparative analysis of clinical and anthropometric parameters depending on risk factors for cardiovascular disease in overweight individuals. *Bangladesh Journal of Medical Science* -2025;**24**:DOI: https://doi.org/10.3329/bjms.v24i1.78717