Contents lists available at ScienceDirect

Clinical Epidemiology and Global Health

Original article

Prevalence of postpartum depression and its associated factors within a year after birth in Semey, Kazakhstan: A cross sectional study

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ARTICLE INFO

ABSTRACT

Background: Postpartum depression (PPD) is a depressive disorder that occurs after childbirth and can last until a year after delivery. The global prevalence of PPD among mothers is between 0.5% and 63.3%. The aim of the study is to determine the prevalence of postpartum depression within a year after birth among mothers in Semey (Kazakhstan) and identify the factors associated with it.

Methods: A cross-sectional study covering 251 women within one year after delivery was conducted in five Primary Healthcare Centers in Semey. The Edinburgh Postnatal Depression Scale (EPDS) for assessing PPD was used. Data was analysed using the Statistical Package for Social Sciences (SPSS), version 25. The statistical significance and magnitude of the relationships between dependent and independent variables were conducted using chi-square and bivariate and multivariate logistic regression analyses. A p-value of less than 0.05 was considered to be significant.

Results: The prevalence of PPD within a year after delivery was estimated as 59.4%. Factors including accommodation type (p = 0.021), satisfaction with living conditions (p = 0.001), relationship with mother-in-law (p = 0.013), the interest of the patronage service about the psychological state of a woman after childbirth (p = 0.001) and husband employment status (p = 0.04) showed significant positive association with PPD.

Conclusion: The high prevalence rate of PPD and associated risk factors imply the need for strengthening and improving of postpartum care program in country. Further research on the experiences and the level of antenatal depression among women will be needed to understand and prevent any possible depressions in prenatal and postpartum periods.

1. Introduction

Depression is one of the most common mental health disorders. More than 3.8% of the population suffer from depressive disorders.[1] According to the World Health Organisation (WHO), women are more prone to depression during their reproductive age than men.[2]

During pregnancy, childbirth and the immediate postpartum period, a woman goes through a range of physical, hormonal and emotional changes. Mood swings, feelings of sadness, fear, confusion and the inappropriateness of own feelings to idealized social expectations can occur in almost every woman in the postpartum period.[3] Postpartum depression (PPD) is a depressive disorder that can develop continuously from the time of pregnancy, or occur after childbirth and lasts until a year after delivery.[4] The main symptoms of PPD include inability to sleep, anxiety, loss of energy and/or interest in daily activities, appetite/weight changes, poor concentration, extreme concern and worry about the baby, guilt and/or hopelessness.[5]

Worldwide, postpartum depression has been reported in almost 10–20% of mothers.[6] The prevalence of PPD in low-middle income countries is the highest (20.14 (range: 16.39–24.50)) in comparison

with upper-middle and high income countries.[6] However, more recently, the results of studies on the prevalence of PPD during the COVID-19 pandemic indicate two times (34% (95% CI: 21–46%)) higher prevalence of PPD among women than before the non-pandemic.[7] It is also worth noting that there are lack of papers to identify PPD in Central Asian countries, including Kazakhstan.[6]

Kazakhstan achieved the Millennium Development Goal (MDG) 5 of reducing maternal mortality ratio and achieving universal access to reproductive health. Over the past two decades, infant and maternal mortality has declined four- and six-fold.[8] Almost all deliveries (99.4%) in the recent two years were carried out in the presence of skilled health personnel and in a medical institution (99.3%).[8] However, there is limited official data on the prevalence of depressive disorders among women in antenatal and postpartum periods in Kazakhstan.[6] An in-depth study of this issue in Kazakhstan only began after the introduction of a universal progressive model of patronage services for pregnant women and young children, developed in collaboration with UNICEF.[9] The introduction of this model began with the pilot implementation of the model in the Kyzylorda region (from 2016 to 2018), with the transition to the national level (2018–2022). During the modernization of the project, significant adjustments were made in the structure of the patronage service with a focus on the physical, psycho-emotional, social development, safety and well-being of the child, and not only on his physical health. The child's health began to be considered in the context of the family, and not isolated from the family and environment.[10]

There are many risk factors associated with PPD, including social, psychological, biological, and genetic factors.[11–13] In a meta-analysis, Hahn-Holbrook et al. identified significant risk factors like maternal mortality, infant mortality, long working hours of women at the child-bearing age, and nations with high income inequality.[14] In another meta-analysis, Wang et al. concluded that the significant maternal risk factors, such as parity, and maternal postnatal depression predict maternal PPD.[15] Among Asian women, culture and traditions have been identified as common predictors of PPD.[16] According to the meta-analyses by Chen Q. et al. and Usmani S. et al., socio-demographic and clinical characteristics, stress and anxiety, lack of various supports, and the COVID-19 related factors were defined as the main risk factors for PPD during the COVID-19 pandemic.[7,17] Thus, we can observe several risk factors for the development of PPD among women, depending on the income, culture and traditions of the country, as well the epidemiological situation in the country.

Feelings of fear of being judged and discussed due to a loss of interest in the surrounding reality, stereotypes and lack of information about the presence of PPD, in turn, often prevents women from seeking medical help.[18] For this reason, in most cases, PPD in the initial period remains undiagnosed.[19] Undiagnosed PPD can progress to a more severe degree - postpartum psychosis, where women often have obsessions about harming themselves or their baby.[20] PPD can also seriously affect a woman's ability to perform maternal duties, which can cause emotional, social and cognitive problems in the child in the future.[21] Subsequently, PPD can also negatively affect relationships within the family.[22] All this points to the need for timely diagnosis of the primary symptoms of PPD and the introduction of effective treatment and care.[21]

Regarding the availability of evidence on the prevalence of PPD, most published work is based on studies conducted in western countries such as the USA, less from Asian settings. Therefore, the aim of the study is to identify the prevalence of PPD and the associated factors in a sample of women in Semey, Kazakhstan.

2. Methods

2.1. The study area, design and period

A cross-sectional study was conducted in Semey (formerly known as Semipalatinsk), located in East Kazakhstan region and 780 km away from the capital city Nur-sultan. Semey is one of the main cities of Kazakhstan with a population of 350,000 people. Semey city has earned it's place in history due to the location of a nuclear test site within it's precincts.[23]

Semey city was selected for data collection and prevalence analysis due to the poor maternal and child health indicators. The East Kazakhstan region has the highest population mortality in the country at 10.36 per 1000 population and is leading in both maternal and child mortality (<5 years of age) rates at 23.4 per 100,000 live births and 10.11 per 1000 births, respectively. By the number of births (15.9 per 1000 population) in the last places across the country.[24] In addition, suicide rates are highest in the East Kazakhstan region.[25]

Data was collected from 15th June to 30th September 2021. To ensure representation of the residents of Semey city, five Primary Healthcare Centers were selected by their geographic distribution for inclusion in the study. The healthcare centers chosen as sampling sites in our study were #3,7,8, Adil-em and Khakim. All sampling sites chosen for this study are involved in the universal-progressive model of patronage nursing system which has special units of postnatal care and vaccination service.

2.2. Study participants and sampling strategy

There were 8360 deliveries in Semey city last year (2020). Of these, a minimum sample of 239 women (prevalence 20%, 95% confidence level) calculated by OpenEpi Collection of Epidemiologic Calculator (https://www.openepi.com/SampleSize/SSPropor.htm) was determined as sufficient to answer the research question.

A convenience sampling approach was adopted to select the study participants. The sample size was proportionately allocated to each healthcare center. Women who visited for a routine postpartum follow-up visit and immunization of their newborns during the study period were surveyed. After obtaining informant consent, a total 251 women, who were within the first year post partum were included in the study. Mothers who could not communicate verbally, those who suffered complete loss of hearing, mental illness or experienced intrauterine fetal death were excluded from the study.[26]

2.3. Data collection tools and procedures

Patronage nurses and researchers collected the data using a structured interviewer-administered questionnaire from mothers who gave a birth within a year. Patronage nurses were previously trained on how to conduct data collection. Data was collected using both online and paper versions of questionnaire. All participants were confirmed their participation in the study.

The Edinburgh Postnatal Depression Scale (EPDS) was used to access PPD symptoms among women in Kazakh and Russian versions. The EPDS is a widely used screening tool for detecting symptoms of pre- and postpartum depression. The scale includes 10 items which range from 0 to 30. As recommended by Beck C.T. et al.,[27] scores greater than the 13 cutoff value of EPDS scale were used to confirm PPD in the study participants.

2.4. Ethical considerations

The study was approved by the Ethical committee of the Semey Medical University (Semey, Kazakhstan (protocol #1 dated February 18, 2021). A set of support and counseling measures has been developed for women who have been diagnosed with PPD symptoms with the participation of a visiting nurse, a social worker and a psychologist.

2.5. Data analysis

The Statistical Package for Social Sciences, version 25 was used for data analyses. Based on the initial review of literature on factors

affecting PPD, three groups of factors were identified for data analysis: 1) socio-demographic factors; 2) pregnancy and delivery-related factors; 3) relationships and social support factors. In the first stage, descriptive and chi-square tests were conducted to assess the statistical significance between suspected PPD ($\geq$10) and each variable. Fisher's exact test was used when more than 20% of cells had expected frequencies lower than 5 (<5). In the second stage, multivariate logistic regression analysis was conducted to identify the magnitude of the relationship between the dependent (PPD ($\geq$10)) and independent variables and analyze crude (COR) and adjusted (AOR) odds ratios with 95% confidence interval (95% CI). A p-value of less than 0.05 was considered to be significant. Table 2 shows results of bivariate and multivariate logistic regression. Variables were included in regression model by forced entry method and checking the multicolleniality of variables.

3. Results

3.1. Overview of the study respondents

The mean age of mothers was 28.3 years (range, 18–49 years old). Participants were divided for two age group: $\leq$28 (n = 144) and >28 (n = 107). Most of participants were married (n = 238, 94.8%) and Kazakh (n = 213, 84.9%). There is a slightly more proportion of women than men who are secondary and tertiary educated. One third of the respondents (23.1%) were housewives. With the rest engage in different professions. The majority of husband/partners was fully employed (n = 223, 88.8%). Forty-nine mothers (19.5%) reported dissatisfaction with their living conditions and 59.4% (n = 149) of them lived separately from parents or relatives. The proportion of women with two or more children was 57.8% (n = 145).

Fourteen women (5.6%) indicated that their husbands/partners do not provide them with any support. The majority of women (n = 170, 67.7%) reported that the recent pregnancy was planned. A total of 28.3% and 20.3% of the mothers reported experiencing complications during pregnancy and after childbirth respectively. Nearly 56% of mothers suffered from "morning sickness" in the early stages of pregnancy. Childbirth occurred at 37 gestational weeks and higher for most of the women (n = 233, 92.8%) and more than three-quarters had a vaginal delivery (n = 194, 77.3%). 13.9% (n = 35) of children born to these mothers had suffered from an illness diagnosed during one year after birth. At the time of data collection 73.7% (n = 185) infants were exclusively breastfed with nearly two-thirds (60.5% n = 152) participants waking up at least 3 and more times at night to nurse their babies. Only 5.2% (n = 13) of mothers interviewed were practicing meditation as at the time of the study. Most of the interviewed women did not have a good relationship with their mothers or they were deceased (n = 202, 80.5%), fathers (n = 182, 72.5%), mother-in-law (n = 120, 50.4%) and/ or father-in-law (n = 120, 50.4%).

The interest of the patronage service about the psychological state of a woman after childbirth were assessed and included as factor of PPD in the study. Based on this, 63.3% (n = 159) women were not interviewed about their psychological state after childbirth by patronage nurses.

3.2. Descriptive and regression analysis results

The prevalence of PPD among the 251 women included in the sample whose EPDS score was 10 higher was estimated as 59.4% (n = 149). The score ranged from 0 to 27. The mean and median was 12.28 (SD = 6.11) and 12 respectively.

Twelve independent variables were shown to be significantly associated with postpartum depression (Table 1). There are: marital status (p = 0.031), accomodation type (p = 0.01), satisfaction with living condition (p = 0.001), family planning(p = 0.05), relationship with mother-in-low (p = 0.031), the patronage service about the psychological state of a woman after childbirth (p = 0.001), complications during pregnancy (p = 0.025), and employment status of husband (p = 0,16).

Table 1

Characteristics of the total sample and bivariate associations of postpartum depression with socio-demographic, pregnancy and delivery-related and relationships and social support factors.

#	Variables	Total	Postpartum depression		p-value[b]
			<10 (no)	$\geq$10 (yes)	
	Socio-demographic factors				
1	**Age**				0,09
	$\leq$28	144 (57,4%)	52 (36,1%)	92 (63,9%)	
	>28	107 (42,6%)	50 (46,7%)	57 (53,3%)	
2	**Nationality**				0,046
	Kazakh	213 (84,9%)	81 (38%)	132 (62%)	
	Others	38 (15,1%)	21 (55,3%)	17 (44,7%)	
3	**Marital status**				0,031
	Married/cohabiting	238 (94,8%)	93 (39,1%)	145 (60,9%)	
	Single/divorced	13 (5,2%)	9 (69,2%)	4 (30,8%)	
4	**Education (women)**				0,275[c]
	Primary	1 (0,4%)	0	1 (100%)	
	Secondary education	87 (34,7%)	40 (46%)	47 (54%)	
	Tertiary education	163[9]	62 (38%)	101 (62%)	
5	**Occupation (women)**				0,52
	Government employee	83 (33,1%)	29 (34,9%)	54 (65,1%)	
	Private company	58 (23,1%)	23 (39,7%)	35 (60,3%)	
	Housewife	52 (20,7%)	23 (44,2%)	29 (55,8%)	
	Others[a]	58 (23,1%)	27 (46,6%)	31 (53,4%)	
6	**Education (husband/partner)**				0,027[c]
	Primary	3 (1,2%)	0	3 (100%)	
	Secondary education	111 (44,2%)	54 (48,6%)	57 (51,4%)	
	Tertiary education	137 (54,6%)	48 (35%)	89 (65%)	
7	**Employment status (husband/partner)**				0,168
	Full employment	223 (88,8%)	86 (38,6%)	137 (61,4%)	
	Part-time employment	19 (7,6%)	11 (57,9%)	8 (42,1%)	
	Does not work	9 (3,6%)	5 (55,6%)	4 (44,4%)	
8	**Accommodation type**				0,01
	Together with the woman's parents	24 (9,6%)	10 (41,7%)	14 (58,3%)	
	Together with the parents of the husband/partner	78 (31,1%)	21 (26,9%)	57 (73,1%)	
	Separately	149 (59,4%)	71 (47,7%)	78 (52,3%)	
9	**Satisfaction with living conditions**				0,001
	Yes	202 (80,5%)	98 (48,5%)	104 (51,5%)	
	No	49 (19,5%)	4 (8,2%)	45 (91,8%)	
10	**Number of children**				0,036
	1	106 (42,2%)	34 (32,1%)	72 (67,9%)	
	2	81 (32,3%)	35 (43,2%)	46 (56,8%)	
	3	40 (15,9%)	18 (45%)	22 (55%)	
	4 and more	24 (9,6%)	15 (62,5%)	9 (37,5%)	
11	**Frequency of waking up at night**				0,202
	0–1	33 (13,1%)	16 (48,5%)	17 (51,5%)	

(continued on next page)

Table 1 (*continued*)

#	Variables	Total	Postpartum depression		p-value[b]
			<10 (no)	≥10 (yes)	
	2	66 (26,3%)	30 (45,5%)	36 (54,5%)	
	3	96 (38,2%)	31 (32,3%)	65 (67,7%)	
	4 and more	56 (22,3%)	25 (44,6%)	31 (55,4%)	
12	**Total sleep per day**				0,591
	4–5	45 (17,9%)	15 (33,3%)	30 (66,7%)	
	6	75 (29,9%)	30 (40%)	45 (60%)	
	7	71 (29,3%)	29 (40,8%)	42 (59,2%)	
	8 and more	60 (23,9%)	28 (46,7%)	32 (53,3%)	
13	**Meditation practice**				0,678
	Yes	13 (5,2%)	6 (46,2%)	7 (53,8%)	
	No	238 (94,8%)	96 (40,3%)	142 (59,7%)	
14	**Meal frequency**				**0,01**
	2	33 (13,1%)	7 (21,2%)	26 (78,8%)	
	3	85 (33,9%)	29 (34,1%)	56 (65,9%)	
	4	101 (40,2%)	49 (48,5%)	52 (51,5%)	
	5 and more	32 (12,7%)	17 (53,1%)	15 (46,9%)	
	Pregnancy and delivery-related factors				
15	**Planned pregnancy**				**0,05**
	Yes	170 (67,7%)	76 (44,7%)	94 (55,3%)	
	No	81 (32,3%)	26 (32,1%)	55 (67,9%)	
16	**Infant gender**				0,24
	Male	134 (53,4%)	59 (44%)	75 (56%)	
	Female	117 (46,6%)	43 (36,8%)	74 (63,2%)	
17	**Type of Pregnancy**				0,49
	Singleton	242 (96,4%)	97 (40,1%)	145 (59,9%)	
	Multiple	9 (3,6%)	5 (55,6%)	4 (44,4%)	
18	**Complications during pregnancy**				**0,025**
	No	180 (71,7%)	81 (45%)	99 (55%)	
	Yes	71 (28,3%)	21 (29,6%)	50 (70,4%)	
19	**Morning sickness**				0,74[c]
	Yes, in the early stages	141 (56,2%)	54 (38,3%)	87 (61,7%)	
	Yes, in the last stages	1 (0,4%)	0	1 (100%)	
	Yes, throughout pregnancy	33 (13,1%)	14 (42,4%)	19 (57,6%)	
	No	76 (30,3%)	34 (44,7%)	42 (55,3%)	
20	**Attending antenatal clinic**				0,07
	Yes	223 (88,8%)	95 (42,6%)	128[4,57]	
	No	28 (11,2%)	7 (25%)	21 (75%)	
21	**Mode of delivery (last pregnancy)**				0,202
	Vaginal delivery	194 (77,3%)	83 (42,8%)	111 (57,2%)	
	Cesarean section	57 (22,7%)	19 (33,3%)	38 (66,7%)	
22	**Complication after childbirth**				0,817
	No	200 (79,7%)	82 (41%)	118 (59%)	
	Yes	51 (20,3%)	20 (39,2%)	31 (60,8%)	
23	**Age of the last child**				0,357
	<3 months	73 (29,1%)	36 (49,3%)	37 (50,7%)	
	3 < 6 months	70 (27,9%)	26 (37,1%)	44 (62,9%)	
	6 < 9 months	53 (21,1%)	20 (37,7%)	33 (62,3%)	
	9 < 12 months	55 (21,9%)	20 (36,4%)	35 (63,6%)	
24	**Infant birthweight**[a]				0,324
	<2,500g	10 (4%)	6 (60%)	4 (40%)	
	≥2,500g	241 (96%)	96 (39,8%)	145 (60,2%)	
25	**Gestational weeks of delivery**				0,875
	<37 weeks	18 (7,2%)	7 (38,9%)	11 (61,1%)	
	≥37 weeks	233 (92,8%)	95 (40,8%)	138 (59,2%)	
26	**Infant illness**				0,053
	Yes	35 (13,9%)	9 (25,7%)	26 (74,3%)	
	No	216 (86,1%)	93 (43,1%)	123 (56,9%)	
27	**Type of feeding**				0,545
	Breastfeeding	185 (73,7%)	72 (38,9%)	113 (61,1%)	
	Artificial feeding	20 (8%)	8 (40%)	12 (60%)	
	Mixed feeding	46 (18,3%)	22 (47,8%)	24 (52,2%)	
	Relationships and social support factors				
28	**Partner support**				0,155
	Never	14 (5,6%)	7 (50%)	7 (50%)	
	Sometimes	92 (36,7%)	29 (31,5%)	63 (68,5%)	
	Often	77 (30,7%)	34 (44,2%)	43 (55,8%)	
	Always	68 (27,1%)	32 (47,1%)	36 (52,9%)	
29	**Relationship with mother**				0,111
	Good	49 (19,5%)	15 (30,6%)	34 (69,4%)	
	Not good/passed away	202 (80,5%)	87 (43,1%)	115 (56,9%)	
30	**Relationship with father**				0,245
	Good	69 (27,5%)	24 (34,8%)	45 (65,2%)	
	Not good/passed away	182 (72,5%)	78 (42,9%)	104 (57,1%)	
31	**Relationship with mother-in-law**				**0,001**
	Good	118 (49,6%)	33 (28%)	85 (72%)	
	Not good/passed away[d]	120 (50,4%)	60 (50%)	60 (50%)	
32	**Relationship with father-in-law**				**0,031**
	Good	118 (49,6%)	38 (32,2%)	80 (67,8%)	
	Not good/passed away[d]	120 (50,4%)	55 (45,8%)	65 (54,2%)	
33	**The interest of the patronage service about the psychological state of a woman after childbirth**				**0,001**
	Yes	92 (36,7%)	59 (64,1%)	33 (35,9%)	
	No	159 (63,3%)	43 (27%)	116 (73%)	

[a] Others include businesswoman and students.

[b] P value is calculated by Pearson Chi-square test.

[c] Fisher's exact test is applied as '1 cells' (25.0%) have expected count less than 5.

[d] 238 women (not including four women who were single or divorced/parents passed away) answered.

After eight variables were included in regression model by forced entry method and checking the multicolleniality of variables, the results of the multivariate analysis revealed only the following six variables to be significant to predict PPD: accommodation type (p = 0.021), satisfaction with living conditions (p = 0.001), complication during pregnancy (p = 0.014), relationship with mother-in-law (p = 0.013), the interest of the patronage service about the psychological state of a woman after childbirth (p = 0.001), employment status of husband (p = 0.04) (Table 2).

For postpartum women who not satisfied with the living conditions had higher odds (AOR = 10.8, 95% CI 2.702–43.197) of experiencing PPD. Adjusted prevalence of depression was more than 8 times higher for women whose husband was part-time employed (AOR = 8.3, 95% CI 1.317–52.638). For women who were not interviewed about their psychological state by patronage nurses (AOR = 4.6, 95% CI 2.453–8.766) and who lived together with the parents of husband/partner (AOR = 2.7, 95% CI 1.312–5.671) and had a poor relationship with mother-in-

low (AOR = 2.2, 95% CI 1.181–4.239) were 4.6, 2.7, 2.2 times higher for to develop PPD, as compared to the women who were interviewed about their psychological state by patronage, lived separately and had a good relationship with mother-in-low (Fig. 1).

4. Discussion

This study is the first study aimed at identifying prevalence of PPD and its risk factors in Kazakhstan. The prevalence of PPD in this sample was 59.4%. This means that there is an increasesd chance that every second woman included in the study presented with symptoms of PPD. This is 5–6 times higher than the estimated PPD prevalence globally which is 10–15%[28] and 2–3 higher than the reported in developing countries (World Health Organization's (2009)). The work of Yakupova et al. was carried out on the territory of neighboring country, Russia. The authors also highlight a high prevalence of PPD in the antenatal 36.4% and postpartum 34.3% periods among women.[29] Studies with similar high prevalence rates of PPD can also be seen in countries such as Pakistan (63%),[30] Afghanistan (60.93%),[31] Eswatini (47.4%)[32] and Croatia (45.03%)[6] and South Africa (39,93%).[33] However, the results of

Table 2
Binomial and logistic regression on predictors associated with postpartum depression.

#	Variable	Category	COR [95% CI]	p-value	AOR [95% CI]	p-value
1	**Marital status**	Married/cohabiting	3.508 (1.050–11.720)	**0.041***	5.797 (0.932–36.072)	0.06
		Single/divorced	1 (reference)		1 (reference)	
2	**Accommodation type**	Together with the woman's parents	1.274 (0.532–3.051)	0.586	2.193 (0.476–13.681)	0,237
		Together with the parents of the husband/partner	2.471 (1.363–4.478)	**0.003***	2.728 (1.312–5.671)	**0.007***
		Separately	1 (reference)		1 (reference)	
3	**Satisfaction with living conditions**	Yes	1 (reference)		1 (reference)	
		No	10.601 (3.676–30.573)	**0.001***	10.804 (2.702–43.197)	**0,001***
4	**Planned pregnancy**	Yes	1 (reference)		1 (reference)	
		No	1.710 (0.981–2.928)	0.058	1.677 (0.853–3.298)	0.134
5	**Complications during pregnancy**	No	1 (reference)		1 (reference)	
		Yes	0.513 (0.285–0.924)	**0.026***	0.419 (0.210–0.839)	**0,014***
6	**Employment of husband**	Full employment	1 (reference)		1 (reference)	
		Part-time employment	1.991 (0.520–7.621)	0.314	8.325 (1.317–52.638)	**0.024**
		Does not work	0.909 (0.184–4.5)	0.907	3.912 (0.466–32.821)	0.2
7	**Relationship with mother-in-law**	Good	1 (reference)		1 (reference)	
		Not good/passed away	2.498 (1.488–4.194)	**0.001***	2.238 (1.181–4.239)	**0,013***
8	**The interest of the patronage service about the psychological state of a woman after childbirth**	Yes	1 (reference)		1 (reference)	
		No	4.823 (2.779–8.371)	**0.001***	4.637 (2.453–8.766)	**0,001***

* = p-value less than 0.05; COR crude odds ratio, AOR adjusted odds ratio, CI confidence interval.
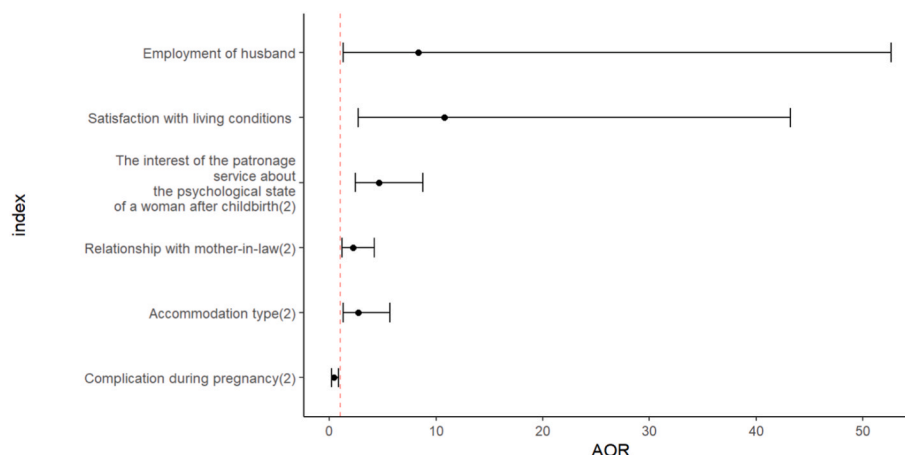
Fig. 1. Adjusted prevalence rate of postpartum depression among women.

our study are much higher in comparison with Spanish,[34] Iranian,[35] Australian,[36] Canadian[37] study, where the prevalence of PPD is reported as 4.4%, 5.5%, 7.9% and 8% respectively.

The possible reason for the high rates of postpartum depression among women up to a year after childbirth may be due to the high rates of depression in the general population of Kazastan. The results of studies conducted in Kazakhstan by researchers Kaitlin P Ward et al.[38] and Yuriy Ignatyev et al.[39] indicate a risk of developing a psychological disorder in the population of Kazakhstan by approximately 40%.

The phased implementation of the new universal - progressive model of patronage (2016–2022) in Kazakhstan has an important role for screening and prevention of PPD among women.[9] The old model of patronage service involved short-term visits by patronage nurses to assess the physical health of the child only. A systematic assessment of the quality of maternal and newborn care in three CEE/CIS countries (Albania, Turkmenistan and Kazakhstan) by Giorgio Tamburlini et al. concluded that the quality of maternal and newborn care was substandard in all the areas explored in Kazakhstan.[40] Due to implementation and transition of universal progressive model of patronage services only for the last five years, the variable assessing the involvement and interest of patronage nurses in the psychological health of women after childbirth was assessed in our study. The results of statistical analysis confirmed that there is a significant relationship between the nurses' interest in a woman's health after childbirth and the development of postpartum depression. These studies indicate the need for further education on appropriate assistance in the postpartum period and need for supervision and training of patronage nurses in the basic modules of the universal - progressive model of patronage. Further studies are also needed to address the knowledge gaps among midwives in Kazakhstan. Einar B. Thorsteinsson et al., Vijayalakshmi Poreddia et al.[41,42] and Cindy J Jones et al.[43] point to the importance of knowledge analysis among women and nurses.

Another possible reason for the high PPD rates in this study may be the epidemiological situation in the country during the data collection period in the wake of the COVID-19 pandemic. Complete isolation of mothers, social distancing, absence of a partner at birth, lack of face-to-face meetings with medical personnel, fear of visiting hospitals can also negatively affect mental health of women, along with changes occurring in the postpartum period. A meta-analysis by researchers Chen et al., shows differences between the prevalence of PPD during pandemic and non-pandemic. The researchers also point to the need for a study on the prevalence of PPD in the middle and low-income countries.[7]

According to the results of multivariate logistic regression, dissatisfaction with living conditions and cohabitation with the husband/partner's parents was found to be a significant predictor of PPD. One possible explanation for this is the importance of cultural norms in the country. Newly married couples are expected to live with the husband or partner's parents. Relationship with mother-in-law is also found to be a significant predictor of PPD in our study. The results of the study indicate the need to take into account socio-cultural factors when developing preventive measures for PPD among women living with parents-in-law. The association in estimation was in line with study of Yue-Yun Wang,[44] Eleri Jones et al.[45] and Qing Li et al.[46] The mother's mental health, which directly affects the relationship with her husband/partner, the health and well-being of the child,[47] should be a priority for all family members.

Significantly higher proportions of depression symptoms were noted among mothers who had complications during pregnancy. The association was in agreement with the systematic review done by Alessandra Biaggi et al.[48] and Tesera Bitew et al.[49] In fact, the results of study showed that PPD was only prevalent during the postpartum period, highlighting the importance of prevention measures in the prenatal period to reduce or avoid PDD.

Interesting results were obtained regarding the husband's employment status. Based on our analysis, the employment status directly affects the development of postpartum depression. We can assume that

household income plays an important role in this. Taking care of a child requires a lot of financial costs, especially during the period of child care and maternity leave of a woman. Our analysis confirms the results of previews studies by Zahra Esli et al.[22] and Yuri Aoki et al.[50] This indicates the need for further research and consideration of the total family income for the development of PPD in women.

Despite the fact that we have achieved the original research goal, our study was not without limitations. First, our study was cross-sectional and as a result causal and temporal relationships could not be inferred. Further studies with longitudinal study designs may help to better understand the relationship between the estimated significant factors and PPD among women. Second, we used EPDS to assess PPD symptoms without confirming the diagnosis by psychiatrists. The prevalence rate of PPD might be lower or indeed higher than in self-reported interviews. This therefore suggests an overestimation or underestimation of the PPD prevalence. However, as the EPDS has been validated for use in many settings, we believe that the findings from this study are a correct reflection of the status of PPD in Kazakhstan. Third, despite the assessed wide range of possible predictors, we cannot rule out the possibility of residual predictors by other unmeasured factors such as women birth experience, intimate partner violence, depression symptoms during pregnancy and marital relationship, which were associated with PPD[51]

Finally, the analysis only covers women who delivered in Semey city and the sample may not be representative of the entire country. While we assume that the findings are generalizable at least in Semey, we recognize that there may be differences in other health system factors across the country. For example, the universal patronage model is not fully offered across the country and therefore PPD estimates and predictors may be different in other settings across the country where such models are not present.

Further research on the experiences and the level of antenatal and postpartum depression among women will be needed to understand and prevent any possible depression in prenatal and postpartum periods. It is important to improve training for patronage nurses and midwives to identify women at risk of PPD and those suffering from PPD as well as to increase awareness of PPD among pregnant and postpartum women and their families. The results of the study will be helpful for healthcare providers in Semey city (Kazakhstan) to impement interventions for women who may need mental care and support.

5. Declaration on interest

The authors declare that they have no competing interests.

Authors' contributions

Madina Abenova: Conceptualization, Data curation, Writing- Original draft preparation; Ayan Myssayev: Supervision; LucyKanya: Writing- Reviewing and Editing; Maria Nicoleta Turliuc: Reviewing and Editing; Ulzhan Jamedinova: Methodology, Software.

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