RESEARCH ARTICLE

Frequency of Postpartum Depression (PPD) in Rawalpindi and its determinants

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ABSTRACT

Background: Postpartum Depression (PPD) is a common complication after childbirth. It has serious impact on mental health of mother as well as behavioral and cognitive development of infant.

Objective: To determine frequency of PPD in a metropolitan area of Pakistan and its associated factors.

Methods: A cross sectional study was conducted at Gynecology and Obstetrics Department of Fauji Foundation Hospital, Rawalpindi over a period of six months from January to June 2022. A total of 252 female patients fulfilling the inclusion criteria were included. Patients Health Questionnaire (PHQ 9) was used for screening of PPD in the test subjects. Patients were categorized into two major groups: PPD (PHQ $9 \geq 5$) and No PPD (PHQ $9 \leq 4$). Odds ratio (OR) with 95% confidence interval was used to determine the association of various factors with PPD.

Results: Out of 252 patients, 87 (34.5%) had PPD while 165 (65.5%) had no PPD. The major determinants were Age > 35 years (OR 5.00, CI 1.286-19.440), BMI > 30 (OR 3.333, CI 0.77-14.43), Gestational Age $\leq$35 weeks (OR 6.354, CI 2.65-10.678), Parity >4 (OR 2.364, CI 0.548-10.19), number of female children >4 (OR 7.670, CI 3.458-9.650), Low birth weight baby (OR 2.529, CI 1.109-5.766), COVID-19 in pregnancy (OR 2.371, CI 1.162-4.838), family history of depression (OR 4.425, CI 2.119-9.242), past history of PPD (OR 3.793, CI 1.780-8.085), no social support from husband (OR 11.379, CI 3.447-37.5) and family (OR 6.322, CI 3.145-12.707).

Conclusion: The major determinants of PPD in this study were lack of social support from husband and family members, previous female children and preterm deliveries. Other risk factors included age, obesity, multiparity, low birth weight, COVID-19 in pregnancy, family history of depression and stressful event during pregnancy, sleep deprivation, bottle feeding practice, and neonatal admission in NICU.

Keywords: Family support, Mental health, Patients Health Questionnaire (PHQ 9), Post-partum depression, Pregnancy.

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Introduction:

Mental health is an important public health concern as it has a significant impact on the overall health of the population.(1) According to World Health Organization (WHO), around 25 percent of world population experienced some sort of behavioral or mental disorder at some point of their lives. Around 12 percent of the worldwide burden of disease is considered to be contributed by mental disorders.(2) The emergence of

Coronavirus Disease (COVID-19) had a profound impact on the mental wellbeing health of people.(3) Amongst all the significant factors, a life event such as pregnancy and childbirth is also one of the leading causes of mental disorder in female patients.(4) Several physiological and psychological changes occur during pregnancy and after the delivery they may affect not only the physical but mental health as well, hence leading to development of mood and anxiety disorders in female patients.(5)

Postpartum Depression (PPD) is one of the most common complications after childbirth. These are the depressive episodes that occur after pregnancy and have a serious impact on mental health of mother as well as behavioral and cognitive development of infant.(6) Apart from various psycho-social risk factors, certain pathophysiological changes (neuroendocrine, neuroinflammation, neurotransmitter alterations, circuit dysfunction, and the involvement of genetics and

epigenetics) also occur during pregnancy which plays a significant role in development of PPD.(7) According to "Diagnostic and Statistical Manual of Mental Disorders", 4th edition (DSM-IV) (8), PPD is a major depressive disorder (MDD).(9) The American Psychiatric Association(APA) has defined PPD as the presence of a Major Depressive Episode (MDE) within 4 weeks after delivery.(10) PPD presents a wide variety of symptoms. Main clinical symptoms of PPD include low mood, feeling of being helpless and hopeless, decreased interest in routine activities, lack of energy, insomnia, restlessness, changes in eating habits, irritability, inability to take decisions, suicidal thoughts and constant physical symptoms that are non-responsive to treatment.(11) There is a substantial variability of prevalence of PPD (0.5% to 60%) among various countries. Furthermore, it also depends on how the disorder is defined, socioeconomic and cultural status of the country, diagnostic tool employed for the screening purpose, and the duration over which the prevalence is measured.(12) In a review study which looked at the data of 565 researches from 80 different countries, revealed that worldwide prevalence of PPD is 17.22% and 1 out of every 5 female experiences PPD which is directly associated with the low income and geographical development. The prevalence of PPD is much lower in developed countries as compared to developing countries.(13) In Asia the prevalence of PPD ranges from 3.5% to 63.3%.(14) It has been noted in some studies that Pakistan has a very high incidence of PPD (17%-63%), one of the highest among Asian countries.(15) This study targeted the population of a metropolitan city, draining the suburbs where there is decent access to healthcare facilities to determine the prevalence in these areas so that the causative factors can be addressed in antenatal and postnatal care.

PPD has been associated with several risk factors which include marital relationship, family support, parity, prenatal depression, socioeconomic status, educational level, obesity, history of postpartum depression, complications during pregnancy. These risk factors vary among different regions and cultures. Identification of these risk factors and early detection of PPD may lead to better health outcome of mother. Hence, it is important to determine association of various socioeconomic risk factors related to PPD in each setup. The main objective of our study was to see the frequency of PPD in patients presenting in a tertiary care hospital of Rawalpindi and to determine its associated risk factors so that early and appropriate

treatment can be given. Timely identification of the risk factors, early diagnosis and management through supportive care, cognitive behavioral therapy (CBT), psychological rehabilitation and pharmacological treatment if needed, has been found to be helpful for improving maternal health outcome.

As wide variations are found regarding prevalence of PPD in different areas of Pakistan (14-16), our study will also help in filling the gap in literature and encourage further research in this area.

Methods:

A cross sectional study was conducted at Gynecology and Obstetrics Department of Fauji Foundation Hospital, Rawalpindi over a period of six months from January to June 2022 after approval from the Institute Ethical Committee (Ref No 599/RC/FFH/RWP).

Estimated size of sample was 217, which was calculated by WHO sample size calculator with 95% confidence interval and 5% margin of error considering 17% as prevalence of PPD in Pakistani population.(13) A total of 252 female patients were included in our study. Inclusion criteria of our study was female patients having age between 20 to 40 years of age. Women who reported to Fauji foundation Hospital (FFH) in their postpartum period either in OBGYN outpatient department (OPD) or came for vaccination of newborns, were included in our study. Patients who had past history of depression or had communication issues or gave incomplete information was excluded from the study. Informed written consent was taken from all patients. Patients Health Questionnaire (PHQ 9) was used for screening of PPD amongst patients. PHQ 9 has a reported sensitivity of 85.5 %and specificity of 70%.(17) PHQ 9 consists of nine questions, based on occurrence of symptoms of depression over the last two weeks. Each question had a score from 0 to 3 regarding how frequently patient is facing the symptom. The questions were asked from the patients in Urdu and interpretation of PHQ 9 was made. Based on total score patients were considered to have None-minimal (score: 0-4), mild (score: 5-9), moderate (Score: 10-14), moderately severe (Score 15-19) and severe depression (Score: 20-27). However, to simplify our data we categorized patients into two major groups "patients with PHQ 9 score ≥ 5 were categorized into PPD group (n=87) while those who had PHQ 9 ≤ 4 were categorized into "no PPD Group (n=165)". A questionnaire was filled to determine the associated risk factors of PPD,

which consisted of socioeconomic and biological details such as age, parity, details of children, obstetric history, social support of family, ongoing illness, socioeconomic and educational status. The reliability of data was evaluated by applying Cronbach's alpha (0.817).

Statistical analyses was performed using IBM SPSS 26. Frequency and percentage were applied for qualitative variables and mean ± SD were used for quantitative variable such as gestational age. Comparison of means among different groups was done by applying independent T test (p value <0.05). Logistic regression analysis was applied and odds ratio (OR) with 95% confidence interval was used to determine association of various risk factors with PPD.

Results:

A total of 252 patients were included in this study, the mean gestational age of patients at the time of delivery was 38.11± 1.18 weeks. The mean gestational age at time of delivery was lower in patients who had PPD (37.66 ± 1.09 vs 38.35 ± 1.167 weeks) as compared to patients who had no PPD. Among 252 cases, 165 (65.5%) had PHQ 9 score between 0-4, 15(6%) had PHQ 9 score between 5-9 and 72 (28.6%) had PHQ 9 score between 10-14. The frequency of PPD in our patients was 87 (34.5%), whereas 165 (65.5%) had no PPD.

The major determinants were sub divided into three groups based on Maternal related, Pregnancy associated and Baby related factors. Table 1 shows that Age> 35 years (OR 5.00, CI 1.286-19.440), BMI > 30 (OR 3.333, CI 0.77-14.43), Parity >4 (OR 2.364, CI 0.548-10.19), no. of female children >4 (OR 7.670, CI 3.458-9.650), Patients having only female children (OR 2.394, CI 1.442-3.976)family history of depression (OR 4.425, CI 2.119-9.242), past history of PPD (OR 3.793, CI 1.780-8.085) has a positive association with the development of PPD.

Furthermore, in Table 2, it is evident that Gestational Age <35 weeks (OR 6.354, CI 2.65-10.678),COVID-19 in pregnancy (OR 2.371, CI 1.162-4.838), history of stressful event during pregnancy (OR 2.213, CI 1.247-3.926), no social support from husband (OR 11.379, CI 3.447-37.5), no social support from family (OR 6.322, CI 3.145-12.707)and sleep deprivation (OR 3.793, CI 2.407-5.978)have a significant association with PPD.

In addition, low birth weight baby (OR 2.529, CI 1.109-5.766), neonatal admission in NICU (OR 2.11, CI 0.891-5.005) and bottle-feeding practice (OR 1.707, CI 1.316-2.210.891-5.005) are major baby related factors responsible for PPD development (Table 3). The frequency of risk factors amongst both groups along with OR is shown in given tables in detail.

Discussion:

Certain factors have been identified in the maternal personal profile in our study as a cause of development of PPD. Maternal age is one such important risk factor. In our study, we found that if the mother was above 35 years, the odds ratio was 5. Although, we had only 12 cases above age of 35 but 9 (75%) of them developed PPD. Furthermore, the similar affect has been observed by Afsheen et, al.(15) However, she and her co-workers looked at the risk of development of PPD in various age groups. There were 178 cases of mothers of 30 or above years of age among whom 36 had very high risk of PPD as compared to mothers aged between 20-29 where among 210 cases only 16 had high risk of developing PPD. Another study by Nilofer and co-workers in 2009, conducted in Karachi and its surroundings which included patients from all parts of the country found that in mothers aged 35 or above, the prevalence of PPD was as high as 38%.(16,17) In the neighboring countries, similar trend was seen by Upadhyay and co-workers in a meta-analysis which was published in 2017, which looked at the studies published in India between 2000 and 2016, where studies clearly identified that a maternal age >35 to be a risk factor.(18) However, in the international studies this is not the case as reported by Agarwal et.al in 2022 where he looked at 58 studies with good strength found that 4 studies placed young females less than 25 at risk, as compared to 3 which favoured older mothers, but numerous other studies conclusively showed that age is not a risk of the development of PPD.(19) One of possible reasons is that the maternal ages have increased in the western population and several women are choosing to have children in the later part of life.(20) Hence, the data about young mothers is lacking. Furthermore, early unwanted pregnancies are more common there. Therefore, these women are unsupported during this testing time, and this results in increased PPD.

In this study high BMI >30 increased the risk threefold for development of PPD (66%, odds ratio of 3.33). Similar effect was seen in the German population by Johar and her coworkers were among 186 cases with BMI >30 23 developed PPD.(21)Although, a number of studies have shown the opposite (22,23) or U-shaped

Table 1: Frequency and percentage of maternal personal profile related factors in PPD vs No PPD patients

Risk Factors		PPD (n=87)	No PPD (n=165)	Total (n=252)	Odd's Ratio with 95% CI
Age (years)	20-29	45 (37.5%)	75 (62.5%)	120(47.61%)	0.200(0.051-0.778)
	30-35	33 (27.5%)	87 (72.5%)	120(47.61%)	0.126(0.032-0.496)
	>35	9 (75%)	3 (25%)	12 (4.76%)	5.00(1.286-19.440)
BMI	18-24.9	27 (37.5%)	45 (62.5%)	72 (28.57%)	0.300(0.069-1.299)
	25-29.9	54 (31.6%)	117 (68.4%)	171 (67.85%)	0.231(0.056-0.958)
	>30	6 (66.6%)	3 (33.3%)	9 (3.57%)	3.333(0.77-14.43)
Educational Status	Illiterate	0	27(100%)	27 (10.71%)	0.014(0.010-0.231)
	12th grade	51 (45.9%)	60 (54.1%)	111 (44.04%)	1.842(1.070-3.171)
	Graduate	36 (31.6%)	78 (68.4%)	114 (45.23%)	0.974(0.588-1.943)
Occupation	Housewife	51(35.4%)	93(64.6%)	144 (57.14%)	1.04 (0.833-1.298)
	Working	36(33.3%)	72(66.7%)	108 (42.85%)	0.948(0.699-1.286)
Number of male children	0	60(48.8%)	63(51.2%)	123 (48.8%)	1.261(0.705-2.575)
	1	24(22.9%)	81(77.1%)	105 (41.66%)	0.311(0.175-0.554)
	2	3(14.3%)	18(85.7%)	21 (8.33%)	0.175(0.049-0.625)
	3	0	3(100%)	3 (1.19%)	0.012(0.011-0.031)
Number of female children	0	51(31.5%)	111(68.5%)	162 (64.28%)	0.928(0.267-1.398)
	1	12(26.7%)	33(73.3%)	45 (17.85%)	0.791(0.378-1.658)
	2	18(54.5%)	15(45.5%)	33 (13.09)	2.612(1.22-5.59)
	3	3(33.3%)	6(66.7%)	9 (3.57%)	1.088(0.262-4.525)
	4	3(100%)	0	3 (1.19%)	7.670(3.458-9.650)
Only female children	Yes	30(58.8%)	21(41.2%)	51 (20.23%)	2.394(1.442-3.976)
	No	57(28.3%)	144(71.7%)	201 (79.76%)	0.792(0.680-0.923)
Socioeconomic status	Lower	3(20%)	12(80%)	15 (5.95 %)	0.500(0.077-3.265)
	Middle	81(35.5%)	147(64.5%)	228 (90.47%)	2.204(0.604-8.038)
	Upper	3(33.3%)	6(66.7%)	9 (3.57%)	2.00(0.306-13.06)
Family History of depression	Yes	21(70%)	9(30%)	30 (11.9%)	4.425(2.119-9.242)
	No	66(29.7%)	156(70.3%)	222 (88.09%)	0.802(0.709-0.908)
Past history of PPD	Yes	18(66.7%)	9(33.3%)	27 (10.71%)	3.793(1.780-8.085)
	No	69(30.7%)	156(69.3%)	225 (89.28%)	0.839(0.749-0.940)

Table 2: Frequency and percentage of pregnancy associated factors in PPD vs No PPD patients

Risk Factors		PPD (n=87)	No PPD (n=165)	Total (n=252)	Odd's Ratio with 95% CI
Gestational Age (weeks)	≤35	3 (100%)	0	3 (1.19%)	6.354(2.65-10.678)
	36	12(50%)	12(50%)	24 (9.52%)	2.745(1.745-5.874)
	37	15(33.3%)	30(66.7%)	45 (17.85%)	1.025(0.967-2.014)
	38	42(51.9%)	39(48.1%)	81 (32.14%)	2.956(1.297-4.986)
	39	12(17.4%)	57(82.6%)	69 (27.38%)	0.457(0.145-0.927)
	40	3(10%)	27(90%)	30 (11.9%)	0.214(0.021-0.547)
Parity	0	33(45.8%)	39(54.2%)	72 (28.57%)	0.423(0.098-1.824)
	1	24(26.7%)	66(73.3%)	90 (35.71%)	0.182(0.042-0.785)
	2-3	24(29.6%)	57(70.4%)	81 (32.14%)	0.211(0.049-0.912)
	4 or more	6 (66.7%)	3(33.3%)	9 (3.57%)	2.364(0.548-10.19)
Comorbid	Yes	57(38%)	93(62%)	150 (59.52%)	1.162(0.949-1.424)
	No	30(29.4%)	72(70.6%)	102 (40.47%)	0.790(0.564-1.108)
COVID-19	Yes	15(55.6%)	12(44.4%)	27 (10.71%)	2.371(1.162-4.838)
	No	72(32%)	153(68%)	225 (89.28%)	0.892(0.804-0.991)
History of stressful event	Yes	21(53.8%)	18(46.2%)	39 (15.47%)	2.213(1.247-3.926)
	No	66(31%)	147(69%)	213 (84.52%)	0.852(0.748-0.970)
Social support of husband	Yes	69(29.9%)	162(70.1%)	231 (91.66%)	0.808(0.724-0.901)
	No	18(85.7%)	3(14.3%)	21 (8.33%)	11.379(3.447-37.5)
Social support of family	Yes	57(26.8%)	156(73.2%)	213 (84.52%)	0.693(0.592-0.811)
	No	30(76.9%)	9(23.1%)	39 (15.47%)	6.322(3.145-12.707)
Sleep deprivation	Yes	42(66.7%)	21(33.3%)	63 (25%)	3.793(2.407-5.978)
	No	45(23.8%)	144(76.2%)	189 (75%)	0.593(0.480-0.732)

relationship, but Johar study is more significant as it looks at a huge case mix, because not only does she looked at the pre pregnancy weight but also the effect of weight gain during pregnancy, showing a significance in development of PPD (p< 0.05). Sundaram addressed this issue in her study in 2012. She found that if we analysed all cases together, it shows that there is a positive co-relationship with obesity but once the co-morbidities are also included such as hypertension, diabetes and poor self-image, then there is no significant relationship.(22) Although, BMI appears to be independent of the concurrent risk factors leading to

PPD, obesity is related to disordered eating habits more commonly associated with underlying depression. Certainly, pregnancy results in increased stress and this tips the balance in the favour of PPD.

A unique cultural preference of male child over female in our region has been highlighted as a significant risk factor for PPD (OR 2.3). In mothers with only female children there is twofold chance and in case if there are 4 or more girls then there is a 7 times higher risk. On the other hand, male child is not associated as a risk factor for PPD. This observation is in line with the

Table 3: Frequency and percentage of baby related factors in PPD vs No PPD patients

Risk Factors		PPD (n=87)	No PPD (n=165)	Total (n=252)	Odd's Ratio with 95% CI
Weight of Baby (kg)	>2.5	75(32.5%)	156(67.5%)	231 (91.66%)	0.912(0.832-0.999)
	1.5-2.5	12(57.1%)	9(42.9%)	21 (8.33%)	2.529(1.109-5.766)
Gender of baby	Male	45(34.9%)	84(65.1%)	129 (54.76%)	1.016(0.789-1.308)
	Female	42(34.1%)	81(65.9%)	123 (48.8%)	0.983(0.753-1.285)
Feeding practice	Breast Fed	33(23.9%)	105(76.1%)	138 (54.76%)	0.596(0.445-0.799)
	Bottle Fed	54(47.4%)	60(52.6%)	114 (45.23%)	1.707(1.316-2.214)
Neonatal admission in NICU	Yes	27(50%)	27(50%)	54 (21.42%)	2.11(0.891-5.005)
	No	60(32.1%)	134(67.9%)	198 (78.57%)	0.880(0.473-1.638)

regional studies.(24,25) In the western literature, this has been conclusively shown to have a weak or no association.(25) Zee et al published a meta-analysis in 2020 where she looked at the regional variation of development of PPD in female child vs male child and she found among 29 studies which looked at 119,736 cases in Asia overall OR was 1.3 but in India it was 2.61 which is very close to the figure reported in our study.

In this study, we observed a direct relationship of PPD with prematurity. We found an increased likelihood of developing PPD especially if the gestational age is less than 35 weeks (OR 6.3 vs 2.7). In a meta-analysis published in 2019 by Arantes et al., it was found that among 26 studies which qualified the screening criteria, 18 studies supported this finding.(26) It was revealed that there was a high OR of 7.6 when both the mother and child were hospitalized, and baby was in NICU which subsequently decreased to 2.2 in the same sample after 06 months of delivery. Although, our study excluded the preexisting psychological disorders, it is worth noting that prematurity is frequently reported in patients with preexisting disorders as reported in a number of studies such as by Uguz and coworkers who looked at the mean gestational ages in patients with major depression, anxiety disorder and panic disorders vs normal population and found that mean gestational age was almost 1 week less in patients with these disorders.(27) Similar effect was confirmed by Galeya et.al where they observed that depression was seen in 73 cases out of 206 cases with preterm birth as compared to 3049 vs 1080 cases. Similar trend was observed in anxiety disorder and panic disorders as well.(28)

It was observed in this study that a parity less than 3 has no significant bearing but once the number of children exceeded 4 or more, the risk factor jumped from OR 0.2 to 2.33. Afsheen and her colleagues who described the risk factors for developing PPD found that among 44 mothers with 4 or more live issues, there a 50% moderate to high risk for development of PPD.(15) In our neighboring country, a study was conducted by Dubey in 2021 which negated any association between PPD and parity less than 4.(29) Zhao and coworkers published a meta-analysis in 2020 in which they highlighted several studies researching PPD and found that most supported multiparity as risk factor.(30) It may be attributed to the fact that subsequent pregnancies occur in the advanced age which already has been discussed earlier. Furthermore, every subsequent pregnancy occurs in the presence of children which already not only require physical help but also require a steady financial income for upbringing. The addition of every child without any substantial increase in the income is only going to increase the stress exponentially.

The presence of support especially from the partner has a direct bearing on the risk of development of PPD. In our study, the odds ratio was a high of 11 as shown in table 2 in mothers who lacked support from family or partner. In 2021 a study was conducted by Lanjewar and co-workers in India.(31) They found that among the patients who suffered from PPD 66.7%(12) to 60%(6) lacked support from family or partner as compared to 82.5%(137) to 76.1%(156) who enjoyed family support. In another regional study by Savarimuthu in 2010, it was found that family support is very important in lowering PPD, but presence of partner has a more direct role.(32)

COVID-19 placed a unique stress on the women in pregnancy as its diagnosis during pregnancy lead to forced isolation during 2020-21. Although, this is no longer being practiced strictly. We observed a twofold rise (OR 2.37) in risk of developing PPD if patient suffered from covid during pregnancy, which is in line with studies and meta-analysis conducted on studies conducted during this period.(33,34) Furthermore, in a meta-analysis by Chmielewska in 2021, it was revealed that during pandemic, risk of development of PPD was also increased as compared to pre-pandemic levels (pooled mean difference 0·42 [95% CI 0·02–0·81; 03 studies, 2330 and 6517 pregnancies).(34)

These findings highlight the importance of determining associated risk factors for PPD among different demographic and socioeconomic regions in order to better understand and address this issue. The identification of risk factors will help us incorporate relevant patient education in their antenatal care. In addition, supportive care can be provided in the postpartum period to the patients at risk. Based on our study, future research can be done to evaluate the effect of early screening and diagnosis followed by early intervention on patient wellbeing. Further, research can also be done on the implications of maternal depression on parenting and child development.

This study has a few limitations. Despite being conducted in a major tertiary care hospital of a metropolitan city, a multi-centered trial would yield more generalizable results. The interpretations may change if additional variables are included, and spouses and family members of respondents are also involved. Better conclusions may be drawn from serial screening of these patients in the prenatal and the antenatal period. Health care providers should be aware of patients' circumstances during pregnancy, as preventing these risk factors may help improve maternal and child health outcomes. Some of these factors are modifiable and may be addressed early during antenatal visits to improve the patient wellbeing. Once the condition has developed, early detection and timely interventions through a multidisciplinary approach involving counseling, cognitive behavioral therapy (CBT), support groups, interpersonal therapy (IPT), psychological rehabilitation and anti-anxiety medication, if required, has the best results.

Conclusion:

In this study, it was concluded that the major determinants of PPD were lack of social support from husband and family members, previous female children and preterm deliveries. Other risk factors included age, obesity, multiparity, low birth weight, COVID-19 in pregnancy, family history of depression and stressful event during pregnancy, sleep deprivation, bottle feeding practice, and neonatal admission in NICU.

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