Treatment gap and barriers to access mental healthcare among women with postpartum depression symptoms (#96085)

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Treatment gap and barriers to access mental healthcare among women with postpartum depression symptoms

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Background and Objectives: Postpartum depression (PPD) is prevalent among women after childbirth, but accessing mental healthcare for PPD is challenging. This study aimed to assess the treatment gap and barriers to mental healthcare access for women with PPD symptoms. **Methods:** This cross-sectional study was conducted from January to June 2023 by administering the questionnaire to the women using stratified random sampling method. 3,220 women in the first 6 months postpartum were screened using the Edinburgh Postnatal Depression Scale (EPDS).Of them, 1503 of the women scored thirteen or above, indicating potential depressive disorder. Interviews were conducted to explore help-seeking behavior and barriers to accessing mental healthcare. Descriptive statistics along with nonparametric tests (e.g., Kruskal-Wallis, Mann-Whitney U) were used and group differences were examined. Scatter plot matrices with fitted lines were used to explore associations between variables. Classification and regression tree (CRT) methods were used to classify the importance and contribution of different variables for the intensity of PPD. **Results:** Only 2% of women (n=33) with high PPD symptoms sought mental healthcare, and merely 5% of women (n=75) had been in contact with a health service since the onset of their symptoms.92.80% of women with PPD symptoms did not seek any medical attention. The majority of women, 1215 (81%) perceived the need for mental health treatment. Women who recently gave birth to a female child had significantly higher depression *(p=0.030)*, high treatment gap*(p<0.001)*, high instrumental barriers *(p<0.001)*and lower social support*(p=0.003)* mean scores. The results of classification and regression decision tree model show that the intensity of PPD symptoms increases mainly with higher instrumental and stigma barriers scores however increase in

perceived social support scores decreases intensity of PPD symptoms. **Conclusion:** Women with PPD symptoms encountered considerable treatment gap and barriers to access mental health care due to lack of maternal mental health services. Public awareness regarding PPD help seeking is critically needed to overcome the treatment gap and barriers

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2   **depression symptoms**

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24 **Abstract**

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32 depressive disorder. Interviews were conducted to explore help-seeking behavior and barriers to

33 accessing mental healthcare. Descriptive statistics along with nonparametric tests (e.g., Kruskal-

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36 regression tree (CRT) methods were used to classify the importance and contribution of different

37 variables for the intensity of PPD.

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39 merely 5% of women (n=75) had been in contact with a health service since the onset of their

40 symptoms. 92.80% of women with PPD symptoms did not seek any medical attention. The

41 majority of women, 1215 (81%) perceived the need for mental health treatment. Women who

42 recently gave birth to a female child had significantly higher depression *(p=0.030)*, high

43 treatment gap *(p<0.001)*, high instrumental barriers *(p<0.001)* and lower social support

44 *(p=0.003)* mean scores. The results of classification and regression decision tree model show

45 that the intensity of PPD symptoms increases mainly with higher instrumental and stigma

46   barriers scores however increase in perceived social support scores decreases intensity of PPD

47   symptoms.

48   **Conclusion:** Women with PPD symptoms encountered considerable treatment gap and barriers

49   to access mental health care due to lack of maternal mental health services. Public awareness

50   regarding PPD help seeking is critically needed to overcome the treatment gap and barriers.

51   *Keywords:* Postpartum depression, treatment gap, barriers, mental healthcare, social support,

52   decision tree.

53   **Introduction**

54   Postpartum depression (PPD) refers to major depressive episode "with peripartum onset" if the

55   onset of mood symptoms takes place either during pregnancy or in the four weeks following

56   delivery (Lu et al. 2023). PPD frequently gets confused with the brief "baby blues" that occur

57   shortly after birth (Parkash 2021). However, symptoms of PPD are more severe, stay longer, and

58   may have the potential to cause postpartum psychosis (Badri 2022). PPD is marked by low

59   mood, loss of pleasure, decreased energy, reduced activity, marked functional impairment,

60   decreased self-esteem, and thoughts of self-harm or suicide (Lund & Town 2016). The global

61   prevalence of PPD is 17.2% (Fish-Williamson & Hahn-Holbrook 2023). The prevalence rate in

62   Pakistan ranges from 28% to 63%, making it the highest among Asian countries (Aliani &

63   Khowaja 2017). A recent study showed 67.96% prevalence of PPD in Pakistan (Zulfiqar et al.

64   2023). As with major depression, suicide associated with PPD has become the second leading

65   cause of death among women (Yu et al. 2021). Children born to mothers with PPD in low and

66   middle-income countries (LMICs) are more likely to have developmental issues (including

67   cognitive issues, language issues, and academic delays), behavioral problems, and adverse

68   impacts on health (Azale et al. 2016).

69   Perceived social support is crucial in predicting and controlling self-related unpleasant life events

70   and depression symptoms. Perceived social support is described as an individual's subjective

71   perception of whether or not their social network is supportive enough (Nazari et al. 2020).

72   Recent study conducted in Pakistan revealed a significant association between social support and

73   the development of PPD (Riaz et al. 2023). Exploratory studies have indicated that

74   lower perceived social support during pregnancy increases the likelihood of developing

75   depression symptoms during postpartum period (Asselmann et al. 2020; Gan et al. 2019; Taylor

76   et al. 2022). PPD is a clinical condition that frequently requires professional medical or/and

77   psychological intervention (Lackie et al. 2021). There are a variety of management options

78   available for PPD, with a strong evidence base to support the use of psychological approaches,

79   including cognitive behavioral therapy (CBT) and interpersonal therapy, peer and partner

80   support, nondirective counseling (Stewart & Vigod 2019). Despite numerous contacts with

81   healthcare providers during the postpartum period, the majority of women with PPD do not seek

82   treatment and are thus left undiagnosed (Bina 2014). According to the literature, a variety of

83   barriers influence help-seeking behaviors in women with PPD (Cacciola & Psouni 2020; Jones

84   2019; Lackie et al. 2021). Studies in high-income countries (HICs) showed that less than a

85   quarter of women with PPD seek professional help, which is why the treatment gap for PPD

86   appears to be larger than for non-PPD (Bina 2014; McIntosh 1993).

87   Addressing treatment gap and barriers to mental healthcare access among women with PPD

88   symptoms in Pakistan is critical for minimizing the negative impacts of PPD on maternal mental

89   health and promoting healthier family environments. Our objective was to assess the treatment

90   gap and barriers to mental healthcare access for women with PPD symptoms.

91   **Methodology**

92 **Study Design and Subjects**

93 A questionnaire-based multicenter cross-sectional study was conducted by administering the

94 questionnaire to the women aged 18-45 years, during the first 6 months postpartum, willing to

95 participate and provide informed consent, and having a PPD screening score of 13 or higher on

96 the Edinburgh Postnatal Depression Scale (EPDS). The study was carried out from January to

97 June 2023. The sample was selected using a stratified random sampling method. First, we

98 selected 5 large populated cities (Faisalabad, Rawalpindi, Lahore, Multan and Gujranwala) in

99 Punjab, Pakistan, and then randomly selected 7 private or public hospitals in each city and

100 received 644 responses from each city. Thus, we had 3340 respondents. Of these, 41 respondents

101 refused to participate, and 79 incomplete questionnaires were not included.

102 **Ethics approval**

103 The approval of study was obtained from the Institutional Review Board, Government College

104 University Faisalabad, Pakistan before initiating the study (Approval number: 13422-S). The

105 study met the guidelines outlined in the Helsinki Declaration. Since the study did not require any

106 clinical intervention and the patient's involvement in the study was clearly below minimal risk,

107 all patients gave informed verbal consent rather than written consent. Face-to-face administration

108 of survey questionnaires was conducted in the native language, Urdu, using validated tools.

109 **Inclusion criteria**

110 The study included women aged 18-45, those within 6 months of postpartum, those who signed

111 informed consent, and those with an EPDS score of ≤13.

112 **Exclusion criteria**

113 Women were excluded from the study if they experienced fetal demise or declined participation.

114 **Study variables**

115   In this study, socioeconomic and obstetric characteristics were considered basic demographic

116   characteristics and independent variables, while social support, barriers to access to mental health

117   care and treatment gap was considered intervening variables.

118   **Data Collection Instruments**

119   The data collection instruments consisted of the following sections:

120   ***Edinburgh Postnatal Depression Scale (EPDS) questionnaire***

121   The EPDS was used to screen for PPD symptoms. This questionnaire comprises 10 questions,

122   each scored on a 4-point Likert scale, with total scores ranging from 0 to 30. A cutoff score of 13

123   or higher was used to identify individuals with significant PPD symptoms (Smith-Nielsen et al.

124   2021).

125   ***Socio-demographic and Obstetrics characteristics***

126   A structured proforma was utilized to gather socio-demographic and obstetrics-related

127   information from the participants.

128   ***Multidimensional Scale for Perceived Social Support (MSPSS)***

129   Perceived social support from the participants' social networks, including spouses, family, and

130   friends, was assessed using the MSPSS. This instrument consists of 12 items, rated on a 7-point

131   Likert scale. Higher scores indicate greater levels of perceived social support.

132   ***Treatment Gap***

133   The treatment gap was assessed by determining the disparity between the proportion of women

134   needing mental health care and those utilizing mental healthcare services. The perceived need for

135   professional mental healthcare was evaluated using a "yes or no" response question. The

136   utilization of mental healthcare services was measured using the General Help Seeking

137   Questionnaire (GHSQ), adapted to assess actual help-seeking behavior rather than intended

138   behavior (Negash et al. 2020a). 📝

139   ***Barriers to Access to Care Evaluation (BACE)***

140   Barriers hindering access to mental healthcare services were assessed using the BACE

141   questionnaire. Participants were asked to rate the extent to which each item had prevented,

142   delayed, or discouraged them from seeking or continuing treatment. Responses were recorded on

143   a 4-point scale ranging from 0 (not at all) to 3 (a lot) (Negash et al. 2020b).

144   **Validation of the Questionnaire** 📝

145   The survey instrument was reviewed by the investigators for content, clarity, relevance, and ease

146   of understanding of the questions. The researchers' views and comments were taken into

147   consideration. Each item on the questionnaire was also linked to the objectives of the study.

148   Thus, it shows the validity of the content. A pilot test of the questionnaire was conducted among

149   a target sample to determine its suitability. Responses of these respondents were not used in the

150   final analysis. Cronbach's alpha was used to estimate the reliability of the items. The Cronbach's

151   alpha was 0.72 for EPDS, 0.68 for MSPSS and 0.78 for BACE indicating good internal

152   consistency.

153   **Data analysis**

154   The Statistical Package for Social Sciences (SPSS, version 25.0) was used for data analysis.

155   Descriptive statistical methods including frequency, percentages and Mean ± S.D were used to

156   analyze the demographic and obstetric features of the study participants. The Mann-Whitney U

157   and Kruskal-Wallis test were used to compare the mean score of treatment gap, Social Support

158   and Barriers across different demographic and obstetric characteristics. Scatter plot matrix with

159   fitted linear regression line were used to present to explore the relationships between treatment

160   gap, stigma barriers, instrumental barriers, social support, and intensity of depression. Finally,

161   classification and Regression tree (CRT) based decision tree method was used to classify the

162   impact and importance of different variables for the intensity of PPD.

163   **Results**

164   A total of 1503 women scored 13 or above on the EPDS, indicating the presence of PPD

165   symptoms. The mean EPDS score for the women was 18.993.

166   *Sociodemographic Variables*

167   The sociodemographic characteristics of the women in Table 1 demonstrated that approximately

168   49% of women with PPD symptoms were between the ages of 26 and 35. The majority of the

169   women (89%) resided in urban areas. Education levels varied among the women, with 36%

170   having attended high school, 14% having no formal education. Employment status indicated that

171   the majority of women were not employed (90%). Approximately 53% of women had more

172   female babies. Regarding marriage duration, 60% of the women had been married for more than

173   6 years. Household income analysis revealed that approximately 60% of the women reported a

174   monthly income between 26,000 to 50,000 PKR. Living arrangements indicated that 71% of the

175   women were living with their spouses' extended family.

176   *Obstetric Variables*

177   The frequency and corresponding percentages of obstetric variables are presented in Table 2.

178   Among the women, 77% had a gestational age of 9 months, indicating a full-term pregnancy.

179   Approximately 61% of the newborns were female. The majority of the women (72%) gave birth

180   in a government hospital. Only 17% of the women reported that the current pregnancy was their

181   first. Additionally, 19% of the women had experienced a previous miscarriage.

182   *Social Support*

183   The mean score for social support was calculated to be 4.376 which falls under the category of

184   moderate social support. Table 4 represents the comparison of mean score of social support,

185   depression, treatment gap, stigma barriers, attitudinal barriers, instrumental barriers across all

186   categories of sociodemographic and obstetric variables. However, the distribution of mean score

187   for social support was found to vary significantly across different categories of age groups,

188   educational status, gender of children, gender of the newborn, and first delivery status (*p<0.05*).

189   These findings suggest that age, educational status, gender of children, gender of the newborn,

190   birth location of newborn and first delivery status are important factors influencing the level of

191   social support received by women experiencing PPD symptoms.

192   ***Depression***

193   The distribution of mean depression scores was not the same across various categories of

194   sociodemographic and obstetric factors including education level (*p<0.001*), the gender of

195   children (*p<0.001*), living arrangements (*p=0.002*), gender of the newborn (*p=0.03*), type of

196   delivery (*p =0.012*), and birth location of the newborn (*p=0.004*) as shown in Table 4. Having

197   more female children and the birth of a female child are significantly associated with higher PPD

198   scores. These findings suggest that education level, the gender of children, living arrangements,

199   gender of the newborn, type of delivery, and birth location of the newborn contribute a

200   significant role in influencing depression levels among women with PPD symptoms.

201   ***Treatment Gap***

202   The analysis revealed a significant treatment gap in accessing mental healthcare services among

203   women with PPD symptoms. Table 3 elaborated that only a small proportion of women sought

204   medical attention for their PPD symptoms, with 33 women (2%) seeking specialized care from a

205   mental health provider and 75 women (4%) were seeking help from a general physician.

206   Majority of the women 1215 (81%) perceived the need of mental health treatment. This indicates

207   that approximately 92.80% of women with PPD symptoms did not seek medical attention from

208   either a mental health provider or a general physician. Table 4 demonstrates that the distribution

209   of the treatment gap varied across various groups of education (*p=0.001*), the gender of children

210   (*p=0.035*), living arrangements (*p<0.001*), gender of the newborn (*p<0.001*), type of delivery

211   (*p=0.012*), birth location of the newborn (*p=0.027*) and first delivery status (*p<0.001*).

212   ***Barriers to Access to Mental Healthcare***

213   The distribution of stigma barriers, attitudinal barriers, and instrumental barriers across various

214   sociodemographic and obstetric factors was assessed. The distribution of these barriers was not

215   the same across all categories of age groups, educational status, and birth location of the

216   newborn (*p<0.05*). Variables, including age, education, and birth location of the newborn, have a

217   significant impact on stigma, attitudinal and instrumental barriers.

218   Figure 1 exhibits a positive correlation between stigma barriers and depression symptoms,

219   indicating that higher stigma barrier scores corresponded to increased mean depression scores.

220   Similarly, instrumental barriers were positively associated with depression symptoms, while

221   social support demonstrated a beneficial impact on mean depression scores, indicating lower

222   depression scores with higher levels of social support.

223   Figure 2 depicts a moderate negative correlation between social support and depression scores

224   emerges, indicating that high social support is linked to lower levels of depression scores.

225   Secondly, a moderate negative correlation between social support and instrumental barriers was

226   identified, suggesting that increased social support coincides with decreased instrumental

227   barriers. Additionally, a strong positive correlation between stigma and attitudinal barriers

228   underscores the connection between elevated stigma and higher levels of attitudinal barriers.

229 Furthermore, our analysis revealed a moderate positive correlation between stigma and

230 instrumental barriers, reinforcing the notion that increased stigma corresponds to more prevalent

231 instrumental barriers. Remarkably, we also found a negative correlation between social support

232 and barriers (stigma, instrumental, attitudinal). Finally, a moderate positive correlation is

233 observed between barriers (stigma, instrumental, attitudinal) and depression, highlighting the

234 potential impact of barriers on elevated depression score.

235 An indication of the relative importance of independent variables, including instrumental

236 barriers, stigma barriers, attitudinal barriers, social support, treatment gap, gender of children,

237 and age, in relation to depression is presented in Figure 3. Among these variables, instrumental

238 barriers were considered the most important, based on their highest normalized importance

239 value.

240 **Discussion**

241 The present study aimed to investigate the treatment gap and barriers to accessing mental

242 healthcare among women with PPD symptoms. Our findings revealed significant disparities in

243 the utilization of mental healthcare services, with only a small proportion of women seeking help

244 from mental health providers or general physicians. This indicates a substantial treatment gap,

245 highlighting the need for interventions to improve access and address the barriers faced by these

246 women. The compatibility of our findings with the Ethiopian study is evident, as both

247 investigations identified a substantial treatment gap among women affected by PPD (Azale et al.

248 2016). The observed treatment gap in both Pakistan and Ethiopia might be attributed to the

249 insufficient prioritization of mental health within the overall healthcare infrastructure and

250 systems. Additionally, in our study the high proportion of women expressing a willingness to

251 seek help from health services for their PPD symptoms suggests a favorable level of

252   acceptability for integrating mental health care into maternal health care platforms within public

253   and private hospitals in Punjab, Pakistan.

254   EPDS scores varied across different categories of sociodemographic and obstetric factors,

255   emphasizing the influence. Education level, gender of children, living arrangements, gender of

256   the newborn, type of delivery, and birth location of the newborn were significant factors

257   influencing depression levels. A similar study conducted in Rural California revealed a

258   significant association between the risk of PPD and factors such as education level, mode of

259   birth, and number of children (Kim & Dee 2018). The presence of similar findings in Pakistan

260   and the United States could be attributed to the universal influence of certain sociodemographic

261   and obstetric factors on maternal mental health during the postpartum period. Social support was

262   identified as a crucial factor. The mean social support score indicated moderate support, and its

263   distribution varied significantly across different categories of age, educational status, gender of

264   children, and gender of the newborn, birth location of newborn and first delivery status. Higher

265   levels of social support were associated with lower depression scores. Findings of the study were

266   consistent with other studies where increased levels of support were associated with lower PPD

267   scores (Chien et al. 2012; Edwards et al. 2012; Morikawa et al. 2015; Pao et al. 2019). Stigma,

268   attitudinal, and instrumental barriers were identified, with age, education, and birth location of

269   the newborn impacting these barriers. Age emerged as a notable factor, with women aged

270   between 26 and 34 exhibiting higher attitudinal and instrumental barrier scores. This finding

271   suggests that women in this age group may encounter specific challenges or attitudes that impede

272   their willingness to seek help for PPD symptoms. Educational status also played a significant

273   role, with women who had no formal education experiencing higher attitudinal and instrumental

274   barriers. This finding underscores the importance of education in promoting mental health

275   literacy and empowering women to recognize and seek appropriate support for PPD symptoms.

276   Moreover, women residing in rural areas faced higher instrumental barriers compared to their

277   urban counterparts. Notably, instrumental barriers emerged as the most important factor

278   contributing to depression symptoms. Our results underscore the necessity of addressing

279   logistical challenges and improving access to mental healthcare services. The study conducted in

280   Israel identified a range of barriers including individual, family, organizational, economic, and

281   public policy levels that hinder PPD women to access care (Alfayumi-Zeadna et al. 2019). These

282   barriers collectively hinder the access of women to PPD treatment. Interventions should focus on

283   reducing barriers, increasing social support, and raising awareness to effectively address PPD.

284   **Limitations**

285   This multicenter cross-sectional design of the study limits us from establishing causal

286   relationships between variables. Additionally, the study was conducted in specific geographical

287   regions, limiting the generalizability of the findings to other populations with different socio-

288   cultural contexts. Lastly, the study focused solely on the perspectives of women with PPD,

289   excluding the viewpoints of healthcare providers and other stakeholders involved in mental

290   healthcare.

291   **Conclusion**

292   The present study highlighted the substantial treatment gap and barriers faced by women with

293   PPD symptoms in accessing mental healthcare services. Our findings revealed that

294   sociodemographic and obstetric factors, including age, education, living arrangements, and birth-

295   related variables, significantly contributed to these barriers. Addressing the challenges of PPD

296   requires targeted interventions and policy changes. Integrating mental health services into

297   maternal care, raising awareness through policy-driven seminars, and empowering women to

298   seek timely help can enhance access to mental healthcare and reduce stigma.

299   **Acknowledgements**

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Table 1(on next page)

Socio- demographics Characteristic of Respondents

1 **Table 1:** Socio- demographics Characteristic of Respondents

Variables	N(%)	Variables	N(%)
Age		**Participant's employment status**	
18 to 25	264 (18)	Employed	150 (10)
26 to 34	738 (49)	Not employed	1353 (90)
35 to 44	483 (32)	**Husband's employment status**	
45+	18 (1)	Employed	1062 (71)
Area of residence		Not employed	441 (29)
Rural	165 (11)	**Gender of children**	
Urban	1338 (89)	More male babies	333 (22)
Education		More female babies	804 (53)
No formal education	213 (14)	An equal number of male and female babies	354 (24)
Primary	336 (22)	No babies	12 (1)
middle	186 (12)	**Household Monthly income**	
High school	534 (36)	25000 PKR or less	381 (25)
Bachelors	198 (13)	26000 - 50000 PKR	906 (60)
Masters and above	36 (02)	50000 - 1 lac PKR	192 (13)
Duration of marriage		More than 1 lac PKR	24 (02)
less than 1 year	30 (2)	**Living arrangements**	
1 to 6 years	576 (38)	Own house	429 (29)
More than 6 years	897 (60)	With the spouse's extended family	1074 (71)

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Table 2(on next page)

Obstetric Characteristics of respondents

1 **Table 2:** Obstetric Characteristics of respondents

Variables	N (%)	Variables	N (%)
Gestational age		**Type of delivery**	
9 months	1164 (77)	Simple Vaginal Delivery	318 (79)
Less than 9 months	339 (23)	C - section	1185 (21)
Gender of newborn		**Is it your first pregnancy**	
Female	915 (61)	Yes	252 (17)
Male	588 (39)	No	1251 (83)
Birth location of newborn		**Any previous miscarriage**	
Govt. Hospital	1086 (72)	Yes	288 (19)
Private Hospital	411 (27)	No	1215 (81)
Home	6 (1)		

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Table 3(on next page)

Contribution of Sources in seeking help by women with PPD symptoms

1   **Table 3:** Contribution of Sources in seekinghelp by women with PPD symptoms

Source of help	Yes N (%)	No N (%)
Formal		
General health professional (any)	75 (5)	1428 (95)
Mental health specialists (e.g., psychiatrists, psychologists)	33 (2)	1470 (98)
Others (Traditional healers, religious leaders)	72 (5)	1435 (95)
Informal		
Husband	726(48)	777(52)
Friends	186(12)	1317(88)
Parents	300(20)	1203(80)
Other relatives	213 (14)	1290 (86)
PerceivedNeed for mental health treatment	Yes N (%)	No N (%)
Perceived the need for mental health treatment for PPD symptoms in the past 6 months.	1215 (81)	288 (19)

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Table 4(on next page)

Comparison of score of Treatment gap, Social Support and Barriers across different demographic and obstetric characteristics

1 **Table 4:** Comparison of score of Treatment gap, Social Support and Barriers across different demographic and obstetric

2 characteristics

Variables	Social support Mean (SD)	p-value	Depression Mean (SD)	p-value	Treatment Gap Mean (SD)	p-value	Barriers Stigma barriers Mean (SD)	p-value	Attitudinal barriers Mean (SD)	p-value	Instrumental barriers Mean (SD)	p-value
Age												
18-25	4.340 (0.9181)	0.005	18.57 (3.745)	0.071	1.34 (0.798)	0.491	13.33 (7.559)	0.047	13.50 (6.102)	0.014	7.15 (5.538)	<0.001
26-34	4.342 (1.0157)		19.06 (3.986)		1.28 (0.920)		14.50 (7.736)		14.63 (6.683)		8.39 (5.366)	
35-44	4.473 (0.9563)		19.06 (3.455)		1.26 (0.875)		14.48 (7.578)		14.35 (6.653)		7.48 (5.390)	
45+	3.733 (0.7761)		19.67 (3.068)		1.50 (1.150)		11.00 (8.812)		11.83 (8.452)		4.17 (3.434)	
Area of residence												
Rural	4.364 (0.9819)	0.488	19.33 (4.191)	0.546	1.24 (0.833)	0.560	15.78 (7.867)	0.025	14.45 (6.999)	0.894	9.02 (5.088)	0.004
Urban	4.378 (0.9815)		18.94 (3.717)		1.30 (0.895)		14.06 (7.640)		14.29 (6.562)		7.68 (5.445)	
Education												
No formal Education	4.203 (1.1207)	<0.001	19.82 (3.67)	<0.001	1.25 (0.853)	0.001	15.35 (8.147)	<0.001	15.20 (6.964)	<0.001	8.99 (5.601)	<0.001
Primary	4.035 (1.0507)		19.01 (3.79)		1.18 (0.771)		17.38 (6.894)		16.24 (6.113)		10.62 (5.114)	
Middle	4.450		19.37		1.29		13.42		13.45		8.31	

	(1.0158)		(3.58)		(1.009)		(7.433)		(6.389)		(4.999)	
High School	4.585 (0.7333)		18.26 (3.54)		1.30 (0.879)		12.66 (6.985)		13.34 (6.196)		5.87 (4.381)	
Bachelors	4.530 (1.0806)		19.61 (4.13)		1.55 (1.005)		13.21 (8.360)		13.68 (7.284)		6.88 (5.881)	
Masters and above	4.275 (0.8872)		19.08 (4.52)		1.00 (0.586)		11.92 (9.545)		13.08 (7.85)		6.75 (7.291)	
What is the gender of your children												
More male babies	4.325 (1.0677)		18.58 (3.44)		1.35 (0.756)		13.95 (8.202)		14.70 (6.577)		7.58 (5.501)	
More female babies	4.386 (0.9752)		19.17 (3.83)		1.29 (0.910)		14.64 (7.555)		14.65 (6.503)		8.35 (5.398)	
An equal number of male and female babies	4.445 (0.8824)	<0.001	18.82 (3.86)	<0.001	1.23 (0.953)	0.035	13.51 (7.507)	0.079	13.00 (6.774)	<0.001	6.81 (5.299)	<0.001
No babies	3.125 (0.8400)		22.75 (3.16)		1.00 (0.793)		18.00 (1.954)		19.00 (2.663)		10.25 (3.166)	
Living arrangements												
Own house	4.375 (1.0233)		19.51 (3.98)		1.47 (0.989)		13.60 (8.615)		14.03 (7.047)		6.85 (5.827)	
With Spouse's extended family	4.377 (0.9644)	0.569	18.77 (3.66)	0.002	1.22 (0.835)	<0.001	14.50 (7.263)	0.077	14.42 (6.426)	0.243	8.22 (5.203)	<0.001
Gender of new born												
Female	4.305	0.003	19.14	0.030	1.19	<0.001	14.34	0.384	14.22	0.497	8.32	<0.001

|												
	(1.0002)		(3.82)		(0.840)		(7.694)		(6.740)		(5.559)	
Male	4.487 (0.9411)		18.73 (3.68)		1.44 (0.939)		14.10 (7.666)		14.44 (6.403)		7.06 (5.111)	
Type of your delivery												
Simple vaginal delivery	4.428 (0.9786)	0.366	18.36 (3.15)	0.012	1.38 (0.948)	0.081	15.66 (6.636)	0.001	15.12 (5.747)	0.005	7.83 (4.491)	0.535
C-section	4.363 (0.9819)		19.15 (3.90)		1.27 (0.871)		13.87 (7.898)		14.09 (6.808)		7.83 (5.647)	
Birth location of newborn												
Home	4.259 (1.0166)		19.09 (3.86)		1.24 (0.835)		15.77 (7.170)		15.34 (6.427)		8.88 (5.314)	
Government hospital	4.663 (0.7946)	<0.001	18.63 (3.500)	0.004	1.42 (1.003)	0.027	10.16 (7.508)	<0.001	11.61 (6.364)	<0.001	5.10 (4.734)	<0.001
Private Hospital	6.050 (0.2739)		23 (2.19)		1.00 (1.095)		18.50 (7.120)		11.50 (0.548)		5.00 (2.191)	
Is it your first delivery												
Yes	4.512 (0.9438)	0.011	18.64 (3.51)	0.169	1.55 (1.087)	<0.001	14.86 (7.896)	0.289	14.33 (6.800)	0.814	7.30 (5.190)	0.117
No	4.349 (0.9867)		19.05 (3.82)		1.24 (0.834)		14.12 (7.635)		14.30 (6.573)		7.94 (5.463)	

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4 P value for variables with two categories were calculated using Mann-Whitney U test and variable having more than two categories

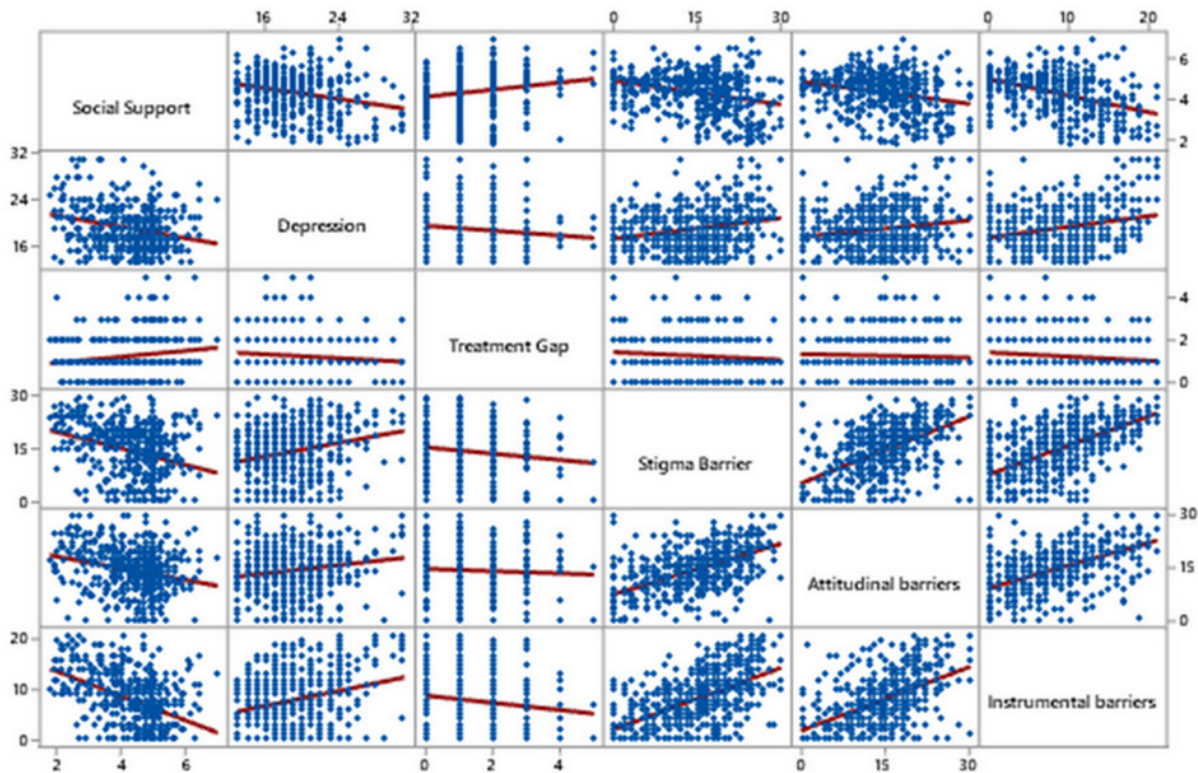5 were tested using Kruskal-Wallis test

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Figure 1

Classification of intensity of PPD using Decision tree with Classification and regression tree (CRT) methods.
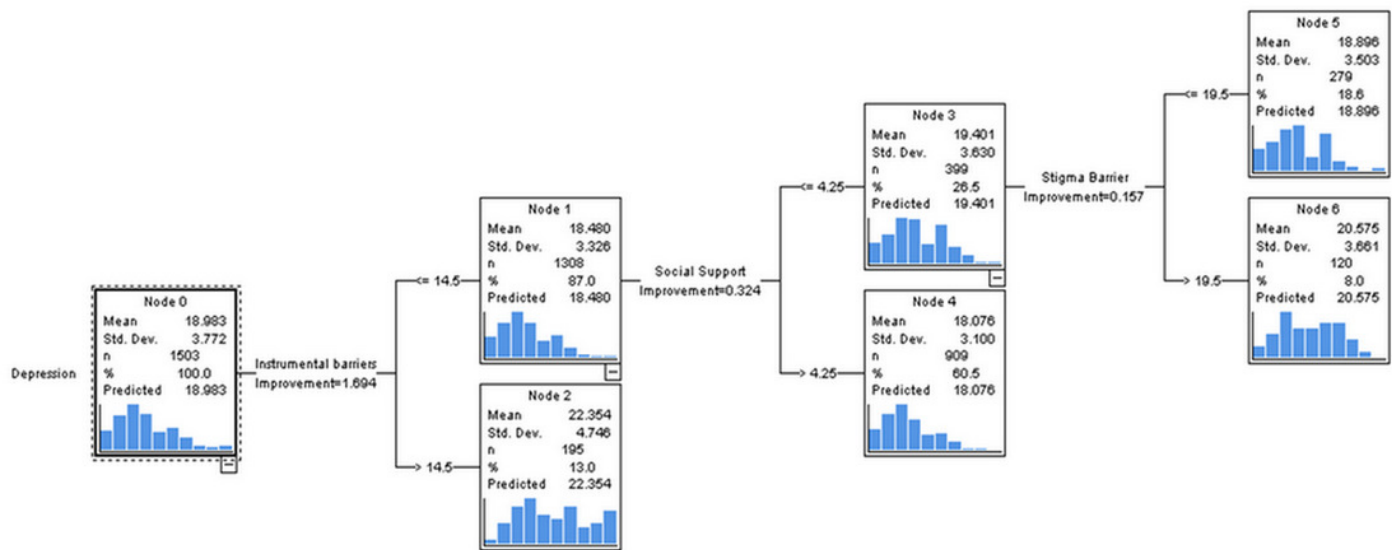
Figure 2

Scatter plot matrix with fitted linear regression line for assessment of the relationship between treatment gap, social support and Barriers.

Figure 3

Importance of variables in PPD using classification and regression (CRT) method.