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Full Length Research Paper

Prevalence and risk factors of postpartum depression and barriers to treatment: A literature review

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Objective*:* To assess the prevalence of postpartum depression, the risk factors affecting the onset in men and women, consequences of postpartum depression on raising a child and the barriers which lie in the way of effective treatment. *Methods:* A systematic literature review written using online databases. PubMed Medline, DynaMed Plus and EBSCOhost were the preferred search engines for this review. Articles were found using the key words below the search was narrowed down based on the main topic of the study, specifically, postpartum depression. All studies were peer reviewed and published between 2007-2018. Results*:* Prevalence of PPD varies dramatically between low income (so called developing) and high income (so called developed) countries and although rates have decreased over the years, it still affects a significant portion of postpartum men and women. In the developed world, the incidence of postpartum depression ranges from 7-12% while the incidence in developing countries may be as high as 50%.[2] Common risk factors were identified in both the developing and developed world. These include low socioeconomic status, poor marital quality, having an African American or Mexican American background and a previous history of depression.[11]

Keywords:Depression, Postpartum, Pregnancy, Psychosocial Factors, Barriers, Consequences, Hormones, Treatment.

INTRODUCTION

Postpartum depression (PPD) is defined as 'a nonpsychotic depression occurring up to one year after childbirth, that is a crippling mood disorder that erodes away at the joy and happiness of new mothers'.[1]It has been proven to have significant impact on the quality of life of both parents and the child of a family when affected, in addition to the financial burden it creates for society.[2] In the more developed Western world, PPD prevalence is much lower, yet there is still a lack of a mandated screening program.[1]The physiology of pregnancy is the same in every individual, however, the cultural practices and life events surrounding an individual differ, making PPD a difficult target for screening and treatment.[1]

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Despite well-known risk factors and tremendous consequences of PPD, it often remains undetected and untreated around the world. Postpartum depression is not currently recognized on its own as a disorder in the Diagnostic and Statistical Manual of Mental Disorders, 5th Edition (DSM-5). Instead, it is classified under Major Depressive Disorder with its qualifying symptoms having onset within the postpartum period, ranging from two weeks after delivery or until one year after birth.[3] According to the DSM-5, the disorder can be diagnosed when five or more of the following symptoms have been present during a consecutive two-week period. One of the symptoms must be depressed mood or loss of interest/pleasure in daily activities. These symptoms must not be attributable to another disease or condition, and include: depressed mood every day, markedly diminished interest and pleasure in daily activities, significant weight loss without dieting, insomnia or hyper-

somnia, psychomotor agitation, loss of energy, feelings of guilt or worthlessness, diminished ability to think clearly and recurrent thoughts of death or suicidal ideations. In order for a patient to have an official DSM-5 diagnosis of PPD, they must have five or more of the listed symptoms nearly every day over a two-week period. [3]Additionally, it is important that depression be distinguished from postpartum blues or postpartum psychosis. The latter is far less common, but much more severe.

Global rates of postpartum depression have proven to be very difficult to measure. Current data varies depending on the inclusion criteria and demographics of the population in question. In addition, many fail to acknowledge the prevalence of PPD in fathers. The negative impact of PPD may be apparent immediately in the way a mother will breastfeed her child, along with a decrease in likelihood that the child will receive proper medical care and vaccinations in the first year of life. [5]By implementing early PPD treatment, long-term effects on the child may be prevented as well.[5,6]

Lack of a universal screening tool for PPD has proven to be a huge barrier for diagnosis and treatment. Most practices utilize the Edinburgh Postpartum Depression Scale (EDPS), however, other surveys are commonly used in conjunction to increase validity of the test. The underlying problem of standardizing these questionnaires for diagnosis remains. Majority of research is targeted towards determining risk factors, so healthcare professionals have more clarity as to what populations to screen. Hormonal changes, alterations in neurological connections and relationship dynamics have all been studied as possible reasons as to why a person would develop PPD, but many believe it is a complex interaction of many different factors. Over the last few decades, the prevalence of PPD has decreased in the United States but remains high enough to be considered a major concern within the healthcare system.[7]

METHODS

The preferred search engines for this systematic review included PubMed Medline, DynaMed Plus and EBSCOhost via library access through both University of Central Florida College of Medicine and St. George's University. Search began in July 2017 and continued until July 2018. Combinations and variations of the following keywords and phrases were utilized to narrow down articles: Depression, Postpartum, Pregnancy, Psychosocial Factors, Barriers, Consequences, Hormones and Treatment. Inclusion criteria for this literature review was limited to articles published after 2007, focusing strictly on postpartum depression and not postpartum psychosis or postpartum blues. Originally, one hundred and eighteen peer reviewed articles involving postpartum depression from around the world were selected and summarized. Twenty-five articles were eliminated from the final selection due to outdated information, not enough focus on postpartum depression or too narrow focus on a specific population of women. Seventy-eight articles met the criteria for inclusion in the final literature review and sixty-three were utilized to write the final paper. This article incorporated meta-analyses, literature reviews and case-control studies focusing on both maternal and paternal PPD, prevalence, risk factors, neurological changes in PPD, hormonal influence on PPD and barriers to treatment.

RESULTS

Prevalence

Prevalence of postpartum depression varies considerably from country to country around the world. Factors influencing prevalence include how developed the country is, the definition of the postpartum period and what diagnostic tools are utilized. A 2017 meta-analysis of 291 studies including almost 300,000 women identified a global PPD prevalence of 17.7% (95% CI 16.6%-18.8%).[8]When considering low-income countries as a separate group, rates of PPD double or even triple, emphasizing the impact of healthcare quality in the developing world.[2]These numbers reflect PPD in mothers, but many fail to include PPD in fathers, with an estimated global prevalence of about 8% in 2016.[7]

Analysis of data from 2007-2017 from thirty countries around the world was collected and is presented in Figure 1 (below). This data represents both high and low-income countries, illustrating disparities between the two. Each value was determined based either on the EDPS or PHQ-9. Sample size varied from less than 100 women to over 5,000 women, depending on the country. If more than one publication was found for a specific country within the last ten years, the average of the prevalence percentages was taken.

Multiple factors contribute to the differences in PPD prevalence around the world. What seems to be the most significant, is the economic status and geographical location of a country.[8]This likely affects an individual's access to proper treatment. For example, countries such as Canada or the United States have a reported PPD prevalence of 8.6% and 11.5% respectively.[8]On the other hand, Pakistan and Saudi Arabia, a South East Asian and a Middle Eastern Country respectively, have a prevalence of 48.4% and 33.2% respectively.[8] The average global prevalence including all 30 countries from Figure 1 is 18.1%; slightly higher but very similar to a larger meta-analysis of over 50 countries published in 2017, that found a global prevalence of 17.7%.[8]

The global PPD prevalence was calculated based on data published from each country, but major differences were present in the sample populations. Some studies were conducted in a specific location within a country, and further generalized to the entire population, which may not be as accurate. Other limitations include a wide range in sample size, ranging from 100 women to over

Figure 1. Postpartum Depression Prevalence Worldwide.

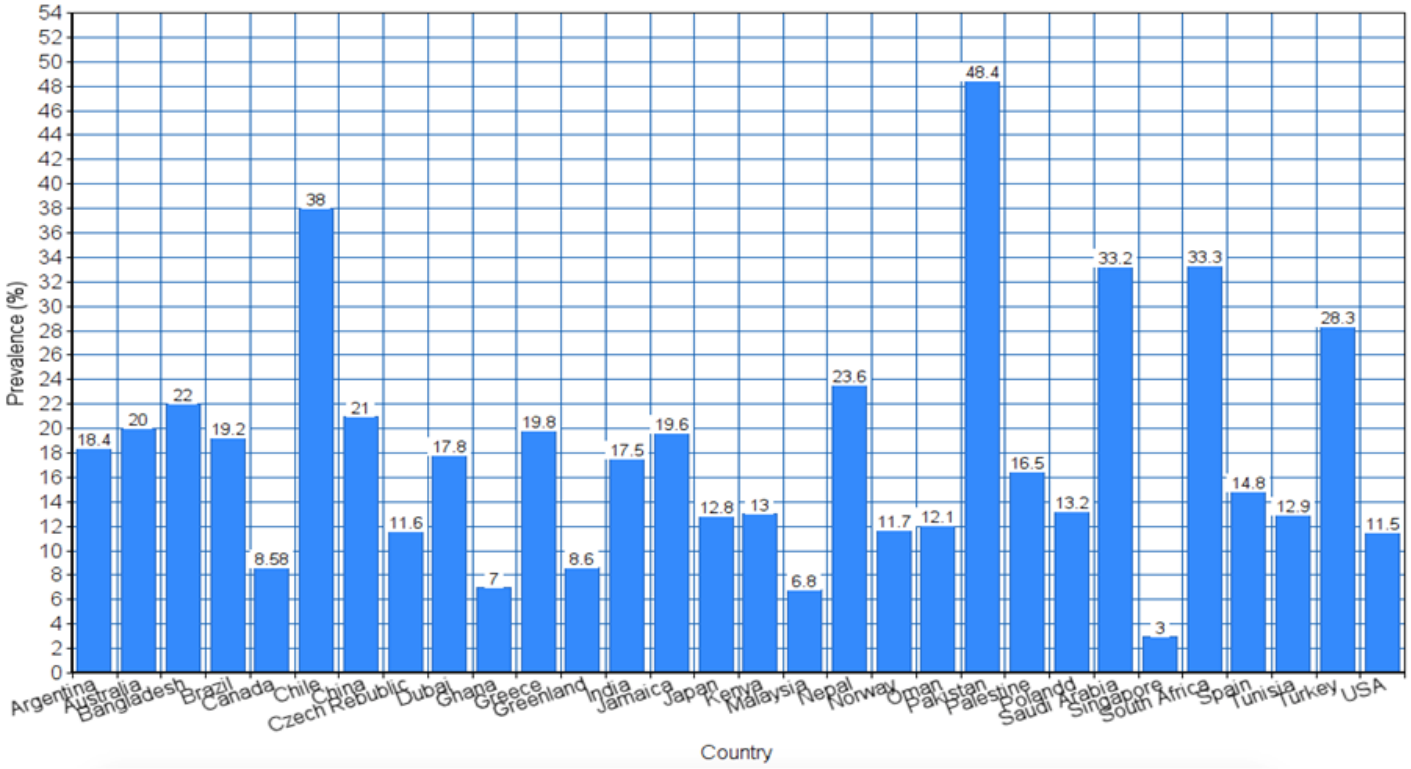

Figure 1. Prevalence rate of postpartum depression throughout thirty countries across the world.[33-62]

10,000 women, and an unspecified cutoff value for the EDPS. Cutoff values ranged from 11 points in Palestine[59], to 12 points in Greece[49], to 13 points used in majority of countries included in this figure. Some prevalence values may have been over or under estimated based on the specified cutoff. The importance of developing a universal screening tool and educating healthcare professionals on postpartum depression should be reinforced in order to properly identify all those who are suffering from PPD.[9,10, 11,12]

Risk Factors

PPD research today tends to target risk factors that increase the likelihood of developing depression in the postpartum period. If common risk factors can be identified, healthcare professionals can better screen for early diagnosis and treatment. Currently, two distinct groups have been documented for a significantly higher likelihood of PPD. Adolescents have a prevalence ranging anywhere from 16% to 44% and minority groups, such as African Americans and Mexican Americans have a two to three times higher risk than the Caucasian population.[11] Other factors such as low socioeconomic status, history of a mental health disorder, lack of family support and stressful life events outside of pregnancy may also increase the chance of developing postpartum depression.[5,11,13]

Table 1 (below) illustrates some of the common risk factors for PPD found throughout the world. By targeting these common risk factors, healthcare professionals can better direct efforts towards screening. While not all studies found each of these factors to be statistically significant, Table 1 represents common risk factors identified across the globe. Previous history of depression or anxiety in the mother seemed to be the most strongly correlated with development of PPD, while no partner support, unwanted pregnancy, lack of social support, decline in quality of sleep and recent stressful life events all were shown to be statistically significant.[14,15] On the other hand, a few publications were able to deny any relationship between parents who underwent in-vitro fertilization or an uncomplicated cesarean section and the development of PPD.[14,15] This is likely due to the success of IVF outweighing the sadness of the inability to conceive, and the joy of a newborn even after a major surgical procedure.[14, 15]

After determining the risk factors for PPD, it is important to examine the underlying cause of PPD to better target treatment options. Hormonal changes, chromosomal abnormalities, neurological disconnections and even sleep disturbances have all been hypothesized to cause PPD, with or without the presence of risk factors.[16,17,18]The question of whether or not there is one definite predicting factor for PPD still remains, and many scientists hypothesize it is a complicated interaction between a wide range of factors.

Hormonal changes are currently the most commonly accepted reason for the onset of PPD, but the actual hormones attributed to this theory are still being explored.

Table 1: Potential factors leading to development of Postpartum Depression			
Family	**Socio-demographics**	**Medical/Health Factors**	**Prenatal Factors**
Lack of partner support	Low income	History of depression or anxiety	Unplanned pregnancy
History of physical, sexual or emotional abuse	Adolescent Pregnancy	Painful or complicated delivery	Inability to breastfeed
No help taking care of newborn	African American	Premature infant	Poor prenatal care
	Mexican American	History of substance abuse	Stress about raising newborn
	Low educational status	Postpartum Smoking	Prenatal Depression
	Living in rural area		
	Lack of health services		

Table 1. List of categorized modifiable and non-modifiable risk factors that have proven to be statistically significant in at least one or more publications.[1, 5, 7, 11, 14, 15, 23, 27-29]

While some studies establish a significant relationship between the two, others fail to establish any relationship at all. Recently, it has been postulated that depression is a faulty interaction between hormones, genetics, stressful life events, medication and past medical history. When a woman gives birth to a child, there is a dramatic decrease in serum levels of steroid hormones estradiol, progesterone and cortisol.[5] Some studies suggest that the drop in progesterone and estradiol may align with the onset of PPD.[5] However, every woman experiences the drop in hormone levels, but not all experience PPD; plus, the change in hormones is unable to explain the onset of PPD in fathers.[5]

When looking specifically at genetic and hormonal involvement together, women with PPD showed a reduction in gene transcription of estrogen binding sites when compared with women who did not develop PPD.[5] This led to the thought that reduced ability for estrogen to bind may increase the risk of PPD, not a decrease in estrogen itself.[5]Another study concluded that even with a hormone sensitive phenotype, the cause of PPD is due to complex interactions between neurosteroids, hypothalamic-pituitary axis reactivity, behavior relationships and fluctuating hormone levels.[19]Dramatic fluctuations in hormones or changes in hormone receptor activity may currently be the most researched possible cause of PPD, but results have been conflicting leading to research in other areas.

Depression is known to cause changes in neurological function, but these changes have been looked at in slim detail when researching depression specifically in the postpartum period. The changes in hormone levels or differences in connections throughout the brain can be considered non-modifiable risk factors for developing PPD. Certain areas of the brain act in regulating mood, and though chemicals play a role, nerve connections between areas of the brain may play a larger role in the onset of depression, inclusive of PPD[18]. Generally speaking, the areas of the brain that play a role in regulating mood include the amygdala, thalamus and the hippocampus. One study examined the relationship between the dorsolateral prefrontal cortex (DLPF) and the anterior cingulate gyrus (ACG), both areas involved in executive functioning and emotional regulation.[18] When compared to a non-depressed group, the women with PPD had significantly lower levels of glutamate, glutamine and N-acetyl aspartic acid in the DLPF.[18] These findings have also been reported in patients during a major depressive disorder, reinforcing the concept that PPD is a subtype of major depressive disorder.[18] In addition, levels of gamma amino-butyric acid (GABA) were assessed in both depressed and non-depressed women in the postpartum period. Lower levels of GABA were found in all postpartum women when compared to women in the follicular phase of their menstrual cycle.[18]However, in 2012 a separate study was conducted, and McEwen found an increase in GABA in women with PPD compared to women without.[18]

Another neurological change that has been thought to be unique to patients with PPD is a disruption in the posterior cingulate-amygdala activity (PCC).[17] It was hypothesized that depressed mothers would have lower PCC connection to other limbic areas when compared to healthy mothers, specifically on the right side of the brain.[17] Two interpretations of conclusions were published: overactive inhibitory connections between the depressed women, and weaker connections in general between the PCC and amygdala and/or hippocampus.[17]Results of this study showed a significant relationship between higher depression scores and lower PCC activity, however, all of the women with lower PCC activity also reported greater night time awakening, bringing in the idea that lack of sleep may play an integral role in PPD.[17]

While it has been theorized in the past, a 2011 study specifically targeted whether or not sleep deprivation or hormonal changes may lead to PPD.[20] Results showed both sleep levels and hormone levels having an important

role in the onset of PPD when observed independently, however when the two were looked at simultaneously, hormone levels seemed to play much less of a role.[20] This specific research was also unique because it looked at the time frame in which the woman developed PPD.[20] Researchers found women who developed PPD shortly after birth had more of a hormonal role, while the women who developed PPD later on were more psychologically vulnerable[20]. Overall, functional MRI's seemed to be the most accurate scanning technique to study neurological changes, and with higher resolution coordinates in the brain, more focus should be placed on the amygdala (specifically the superficial and basolateral nuclei) and the connections between the DLPF, while controlling for sleep.[17,20]Research in this area seems promising, but a tremendous amount of funding is needed to solidify these hypotheses.

Consequences

It is well known that depression can have detrimental effects on a person, no matter when the diagnosis takes place in their life. Less studied are the consequences on children of depressed individuals, specifically those with PPD. Multiple reviews conclude that PPD in mothers is positively correlated with a number of behavioral, cognitive and health related consequences, continuing up until the child enters adulthood at eighteen years old.[5,9] Children with at least one parent affected by PPD seem to have poorer concentration, slower cognitive development and even a higher likelihood of developing a mental health disorder themselves.[5,10]

In addition to developmental consequences of PPD, the monetary burden of postpartum maternal mental health is astronomical. Billions of dollars are spent annually on health problems related to PPD, and even more money is lost if the depression becomes debilitating to everyday activities.[10]Parents stop going to work, they are unable to care for a child and simple daily activities become chores. While proper treatment and counseling may be expensive for an individual suffering, the cost of not treating an individual is thought to be much higher long term. Developmental consequences as well as the timing and severity of depression are continually being studied, in addition to the cost of treatment and counseling for all individuals involved.

Barriers to Treatment

The research and understanding that is still needed to fully grasp PPD is endless and it will take countless resources and time to put an end to this debilitating disorder. Screening efforts should be increased in areas they are already in place and made mandatory in areas that do not currently have them. Only a few states in the U.S.A. have mandatory screening policies or are just now beginning to reimburse physicians for their services when a patient has PPD. More research needs to be conducted to determine who best can diagnose and treat PPD. Trained nurses or mental health counselors can be trained efficiently, while other research shows an obstetrician or pediatrician might be best because the mother is already in the presence of him or her throughout the pregnancy and postpartum period.[5] In addition, roughly 50% of women who are diagnosed with PPD have an onset of depressed mood occurring during pregnancy.[21] Screening and treatment during early pregnancy may eliminate some of the long-term effects on both the newborn and the mother if targeted appropriately.

One of the most recognized barriers to treatment today is simply the lack of a proper tool for diagnosis. If healthcare professionals can be adequately trained on the diagnosis of PPD across the board, incidence will likely rise, but long-term, prevalence should decrease due to referral for proper treatment.[12] In addition, the stigma of weakness and vulnerability associated with depression needs to be eliminated. Many women, even once properly diagnosed, never seek treatment because they do not want to be seen as weak or attention seeking.[22] Anti-depressants and access to a psychiatrist seem to be widely available in society, but the truth is many are unable to afford counseling, medications, or even time off of work to access these services.[23] All aspects of PPD prevention exist in today's society, and when combined, the burden of PPD should decrease significantly. Primary prevention of PPD includes behavior modifications, secondary prevention includes screening at pre and postnatal visits, and tertiary involves medications and counseling services. Details involving multiple prevention methods are further mentioned in the 'discussion' section.

DISCUSSION

Prevalence

Global prevalence of postpartum depression is not consistently documented in the literature. Estimated prevalence of postpartum unipolar major depression depends on how developed the population is, the length of time following delivery for which prevalence is determined and the diagnostic tools utilized.[21] The most recent global data from 2009 showed an incidence rate between 7-12% in high income or more developed countries such as those in Europe and Australia.[2] In contrast, a study including more than 40 countries showed an incidence rate of 15%, however, this result may be skewed due to the inclusion of low income or so called developing countries.[2] When looking atlow incomecountries on their own, rates were as high as 50-60%, proving that the burden is much higher than in the developed world.[2] In 2012 in the U.S.A. alone, the prevalence of PPD across 27 states was measured at 11.5%, with ranges from 7% to 20.1%.[7] Although these numbers remain high, this is a dramatic decrease from a

prevalence of 15.4% in 2004 across the same 27 states.[7]
A major reason for inconsistent data is the lack of a universal screening tool or scale for diagnosis. Most countries utilize the EPDS, but there are a few other valuable depression scales worth mentioning. The Hamilton Rating Scale for Depression (HAM-D or HRSD) must be administered by a health care professional and functions to determine the severity of a patient's depression.[24] In majority of states in North America, the Pregnancy Risk Assessment Monitoring System (PRAMS) is sent out to monitor infant morbidity and mortality but may also be useful for detecting postpartum depression in mothers when completed accurately.[25] This survey works by selecting a stratified sample of women from each participating state and sending a questionnaire after delivery, helping to obtain prevalence data across the United States.[25]
All of this data strictly includes postpartum depression in mothers, but most fail to indicate that PPD is also a serious mental health problem in fathers as well. A 2016 meta-analysis from research across world estimated a global prevalence of about 8% for paternal PPD.[7] Approximately two times more fathers admit to depression in the postpartum period when compared to fathers outside of the postpartum period.[15] Similar to maternal PPD, rates can vary dramatically by location, with paternal PPD rates in North America reaching up to 13% between the three to six-month period.[7]

Risk Factors

Risk factors are currently themost researched aspect of PPD, assuming that if certain risk factors can be prevented, the outcome may never occur. Studies in this literature review included risk factors from socioeconomic status, use of in vitro fertilization and even position of the baby before birth to see if this impacts the stress level of the mother.[5,15,26]Research has shown support of risk factors including race, ethnicity, age and education; most of these, however, are covered by changes in socioeconomic status, specifically those living in poverty.[5]
One study attempted to find a correlation between the position of the fetal head before delivery, and onset of PPD.[26]Near the end of the third trimester just before delivery, a fetus should begin to turn facing backward with their head first (occiput anterior), to make for an easy delivery. If this does not occur, the mother is much more likely to have a difficult vaginal delivery, involving use of forceps or other birthing tools by the physician, or even a cesarean section. The thought behind research on this topic is the changes in stress hormones from difficult vaginal delivery may lead to a higher likelihood of PPD, but no association was found between the two.[26]
The most significant risk factors for PPD in a mother included previous depressive episodes, obesity, and poor sexual function post pregnancy.[26] Similarly, when looking at stressful deliveries, is the concept of those women receiving emergency cesarean sections being at a higher risk for developing PPD. A 2017 meta-analysis determined a significant correlation between cesarean sections (although no differentiation was made between elective and emergency) and a higher chance of developing PPD.[27] The cesarean sections were involved specifically with stressful deliveries leading to postpartum hemorrhages, bladder dysfunction, uterine rupture, gastrointestinal dysfunction or chronic pelvic pain long term.[27] The adverse risks associated with cesarean sections led to increased stress in the mother and a greater likelihood for developing PPD, however, women who underwent an uncomplicated cesarean section showed no increase in risk for PPD.[27]There is still questionable research on whether or not the mode of delivery and use of in vitro fertilization contribute to an increased risk of PPD, however a Norwegian cohort study with almost 60,000 women founded that women who elected for a cesarean section had poorer mental health during pregnancy, but the mode of delivery had no impact on the likelihood of PPD.[14, 15]
Although conclusions vary between studies, by narrowing down the most common risk factors across certain populations, screening for PPD can be implemented more accurately, leading to more women receiving proper diagnosis and treatment. Aside from low socioeconomic status or a previous history of depression, moderate risk factors include low self-esteem, poor marriage quality, lack of social support and stressful life events occurring during pregnancy or the postpartum period,[5] also illustrated in Table 1. It was previously thought that couples utilizing in vitro fertilization would have an increased risk of PPD, but this was proven to be statistically insignificant. A study in a large Swedish hospital concluded that depression is associated with failure to conceive via in vitro fertilization, however, the successful mothers and fathers reported better mood and self-esteem, most likely due to the success of finally having a child.[15]
Overall, women at higher risk for developing PPD include those in developing countries, those of lower socioeconomic status, women of African American descent or women with a history of depression.[11,28] Similar risk factors are present in paternal PPD, with much higher rates in men who smoke or who's partner is also currently depressed.[7] These results emphasize future efforts of screening both the mother and the father for depression before and after the birth of a child. Other literature reviews focusing on the general risk factors for PPD were hard to come by, however, a specific review on PPD in low income women in the Western world provided many similar findings to this review.[1] As mentioned previously, many of the risk factors for PPD were related to low socioeconomic status which at many times, is inclusive of women living in poverty, minorities, young mothers and those with little education.[5]

Many believe that an unintended pregnancy has a significant impact on the incidence of PPD, but this may not necessarily be the case. A secondary analysis performed on first time mothers deduced that unintended pregnancy did have an increased chance of resulting in PPD, but it was not an independent factor.[29] This study does mention that it was not controlled for pre-existing psychiatric conditions including anxiety and was performed on a population of first-time mothers in Pennsylvania.[29] It did however determine that there was an increased risk for postpartum depression observed in women with pre-pregnancy depression and Hispanic or Asian race but failed to control for age.[29]

When looking precisely at adolescents in the United States, many potential risk factors have been identified. Those risk factors with the greatest significance included a previous history of depression, history of sexual or physical violence, lack of support from the father and how the new mother perceived stressful life events in general.[11] Other risk factors identified in the Pregnancy Risk Assessment Monitoring System (PRAMS) include less than twelve years of education, single marital status, postpartum smoking, infants needing postnatal care after birth or three or more multiple stressful life events after birth.[7]Adolescents and adults perceive life stressors differently, so it is important to consider the age of the mother at childbirth.

Aside from a newborn child to take care of, decreased quality and quantity of sleep are commonalities between almost all new parents. The poor quality of sleep after the birth of a new child is thought to be another risk factor associated with postpartum depression, although little research has been done on the topic first hand. A 2012 study in the United States examined both sleep quality, and hours of sleep on postpartum women using actinography and self-reporting sleeping patterns.[16] The study found that 50% of the women admitted to insomnia after the birth of the baby and nearly all participants experienced deteriorations in sleep.[16] But, how does the severity of sleep deprivation affect the severity of PPD symptoms? Results showed that poor sleep maintenance was associated with more severe symptoms, while reduced hours of sleep showed less of an association.[16]Some even believe that sleep may have more of a role in PPD onset than hormones.[20] Self-reported sleep disturbances are a criterion for diagnosing a depressive episode and are a common theme between men and women with PPD. When controlling for medication, it was determined that for every point increase on the Pittsburgh Sleep Quality Assessment Test (meaning they had lower quality sleep), a woman's chance of a reoccurring episode increased by 26.8%.[20] While this value is significant, there was no correlation found in women who had never had a prior episode of depression.[20]

While not as prevalent as mothers, fathers are two times more likely to be depressed in the first year postpartum than in the general population.[7]Rates are highest in the U.S.A. currently, likely due to the lack of paternal leave benefits.[7,15]Some risk factors overlap, but paternal PPD seems to be most influenced by the father's education status, age, smoking status, past psychological history and whether or not his partner is depressed.[7] However, a recent meta-analysis in Canada established that socioeconomic status does not play as significant of a role as in maternal PPD.[7] Additionally, impaired father-infant bonding may be noted as early as eight weeks into a child's life if the father has symptoms of PPD.[6]

While both maternal and paternal PPD can occur on their own, it has recently been studied in couples, providing useful information for moving forward, specifically with screening guidelines. Significant risk factors for PPD in a mother are a previous history of depression, low social support and a large number of stressful events in life; while the main risk factors for paternal PPD are low income, previous history of depression, low social support and smoking.[28] Many of the factors are influential on both the mother and the father, and when looking at the two individuals as a couple, the more significant risk factors were low income (likely related to stress about raising a child), and depression in the mother in the prenatal period.[28] Majority of research with depressed couples has been done in higher income countries in the Western World, and it is thought that results may be slightly skewed because of higher dropout rates when both parents were depressed.[28]

Consequences

The negative effects of PPD on both the child and the parent can be apparent immediately after birth. Research has shown that women with PPD are less likely to breastfeed their childor have more trouble when attempting to breastfeed.[5]A mother with PPD may also be less likely to take the child to the doctor, use home safety devices, place child in a safe sleeping position and there may even be an increased likelihood of child abuse.[5]These consequences have been studied up until the child reaches eighteen years of age.

Each year in the United States, nearly fifteen billion dollars is spent on mental health related hospitalizations in the postpartum period,[10] this number does not include behavioral therapy sessions, or the effects on fathers and children as well. On top of this number, the annual cost of *not* treating a mother with PPD has been estimated at just over $7,000 per mother, coming from loss of productivity and income.[10] Similar research did not include the monetary burden of paternal PPD. Additionally, children of parents with PPD tend to have higher medical claims than children of healthy parents.[10]These numbers continue to increase annually, emphasizing the need for treatment and prevention efforts.

There are a significant number of research studies published

to analyze the implications of PPD in either parent on a young child's life, until he or she reaches adulthood. While no concrete conclusions have been made, PPD has shown correlation with cognitive, behavioral and health related consequences.[5] There is also data showing a more significant impact in early years on boys than on girls, specifically with cognitive development, for unknown reasons.[5] High levels of stress throughout early development in a child may adversely affect brain development and later cognitive functioning.[30] A 2016 Italian study observing untreated parental postpartum depression founded a significant correlation with poor engagement in enrichment activities, such as reading, singing songs and telling stories.[6] Even once maternal depression was controlled for, developmental problems continued to persist with paternal PPD, highlighting the importance of targeting both parents for screening and treatment.[6]Another recent study in Canada tried to find a correlation between more serious health consequences, such as infant seizures and maternal PPD.[29] Exposure of the child to maternal stress and anxiety may have an impact on infant seizure occurrence, proven by a significant relationship between maternal depression and early onset infant febrile seizures.[29] However, many factors may influence febrile seizures such as weakened immune system, poor sanitation and increased stress.

Many of the lasting effects of PPD on children depend immensely on contextual risk factors, and not all children show unfavorable development in their lives.[30] A study in the Netherlands concluded that approximately 13% of children are exposed to some type of maternal depression within the first year of life and attempted to determine how this may affect school performance down the road.[30] Early maternal PPD has a significant correlation with a poor ability for a child to cope with emotional distress in school, such as losing a game, as well as lower self-esteem.[30] However, aside from the above findings, the most striking finding from the Netherlands study was the decreased ability for children to internalize and externalize their problems when they were raised by depressed mothers at any point in time.[30] Another literature review also foundevidence of poorer cardiovascular and gastrointestinal function in children by ten years old, when raised by mothers with PPD; however, statistically significant results have not been reciprocated elsewhere.[5]

Barriers to Treatment

While screening and early detection is extremely important in diagnosing postpartum depression, it is just as important for physicians, nurses and midwives to be informed on how to manage these patients appropriately. A Saudi Arabian study questioned 181 nurses and 143 midwives and concluded that majority lacked knowledge about the definition, prevalence, risk factors and treatment of PPD based on a questionnaire.[12] The confidence of healthcare professionals has been correlated directly with the level of knowledge on the disease.[12]

Considered more of a 'barrier to diagnosis,' lack of a universal screening tool is a hurdle that needs to be overcome. Most practices today use the Edinburgh Postpartum Depression Scale (EPDS), which was developed specifically for screening postpartum women for depression in different settings. It consists of ten questions that are scaled by a score of 1-3 depending on severity and should take less than five minutes to complete. Although this may seem like an appropriate universal screening tool, no universal cutoff score exists. Currently, cutoff scores vary between countries, ranging from 9-13, making it difficult to analyze data from groups of people standardizing results.[9] The survey was also developed specifically for women and there has been no research on whether the EPDS is an appropriate tool for men. Benefits for using the EPDS include a safe way of communication, increasing awareness of PPD, easy accessibility and the survey can even be used in conjunction with other scales to provide a more holistic picture.[10] According to community health guidelines, the EPDS should only be given by trained community health nurses and is not a proper diagnostic tool, but merely a screening tool of PPD.[10]

Other screening tools that are widely utilized and worth mentioning include The Hamilton Rating Scale for Depression (HAM-D or HRSD), The Beck Anxiety Inventory (BAI) and The Structured Clinical Interview for DSM-5 (SCID). The HAM-D or HRSD must be administered by a health care professional and functions to determine the severity of a patient's depression.[24]Developed in 1960 by Dr. Max Hamilton, the HAM-D is best utilized to measure the severity of depression after diagnosis; especially in conjunction with drug trials.[31] Additionally, the Beck Anxiety Inventory (BAI) is often side by side with the HAM-D but deals with anxiety and not depression, but the two often co-exist. In order to establish other co-morbidities that occur with depression, researchers may reference the Structured Clinical Interview for DSM-5 Disorders (SCID). The SCID is a semi structured interview created to diagnose any of the DSM-5 disorders. This is designed to be given by a health professional or trained clinician. It assists in the research setting to determine if there are other mental disorders that may be correlated with PPD and increases the validity with a universal screening tool. Though none of these surveys are meant for diagnosing PPD on its own, they are helpful in indicating PPD, discovering comorbidities and determining severity.

Aside from finding the best screening methods, postpartum depression, like depression in the general population, has many negative stigmas associated with it that must be eliminated in order for men and women to accept treatment. In a group of women with PPD, many said they were unwilling to seek help because they did not

want to feel weak, selfish or attention seeking.[22] Research shows that creating an anti-stigma campaign in developed countries specifically could help with reducing the negative thoughts people have towards others with PPD and this may help more women and men seek treatment.[22] Putting the attribution theory to use in creating anti-stigma campaigns has helped with other mental illness stigmas in the past, and it is believed that it may help with PPD as well.[22]Another important barrier is tangible access to treatment for women in lower income areas. This may include therapy being covered fully by Medicaid, or affordable antidepressant medication.These are just a few of the reasons why close to 80% of women, once diagnosed, still do not receive treatment for PPD.[23]

Medical treatment for depression is widely available in today's society, but nearly 60% of individuals with PPD never receive the proper diagnosis. Even so, of those who are diagnosed, 50% will never receive treatment.[7] From a financial standpoint, many women cannot afford to make an appointment with their physician to discuss their feelings, do not have reliable transportation or believe they could not afford treatment.[31] Another concern, regardless of socioeconomic status, is the stigma that anti-depressant drugs affect breastfeeding abilities.[5] Multiple studies concluded that a woman taking anti-depressant medication had low or undetectable levels of drugs and drug metabolites in breast milk or in the infant's serum.[5] Pharmacotherapy for depression in the postpartum period has been proven very safe for women while breastfeeding.[5] Early detection of PPD is crucial for both the parent and the child and although measures have been taken to increase screening, barriers to treatment still remain high and a small number of those diagnosed are willing and able to seek proper care.[23]

Research involving neurological changes in PPD specifically is very limited, but the available data seems promising.It is important that this area continue to be explored to successfully develop treatment. If the specific coordinates where neural connections are dysfunctional or neurotransmitters are in off balance can be targeted, pharmacotherapy may be more accurately developed for successful treatment.[17,18] The current setback with this research is the cost associated with imaging or scanning the brain on a larger scale, as well as the time commitment required by women in the postpartum period.[17,18]

Some primary prevention methods may also be beneficial when trying to decrease the prevalence of PPD. Based on the findings in this literature review, behavioral interventions to improve sleep quality for both men and women in the postpartum period may decrease the prevalence of PPD onset, as well as providing ways throughout the pregnancy to increase partner support once the baby is born. Many of the fathers who develop PPD, had a partner with PPD initially, so by preventing PPD in one of the parents, the other may also remain disease free.[28] In November of 2015, a bill was introduced in Massachusetts titled "Bringing Postpartum Depression Out of the Shadows Act of 2015" to make grants for states for screening and treatment for maternal depression.[32]This legislature was a step in the right direction, however, nowhere in the bill does it recognize paternal PPD, which is now recognized as a significant cause of mental illness in men.[32] Published guidelines should be made available in the DSM-5, the standard classification of mental disorders, for both maternal and paternal PPD. Currently, the DSM-5 does not recognize PPD as a disorder of its own, but a classification of major depressive disorder, with the episode occurring during pregnancy or within one year of birth.[3] This definition prevents men from being properly diagnosed due to the inability to become pregnant or give birth, so more structured diagnostic criteria for men is necessary.

CONCLUSION

Addressing the risk factors associated with PPD, common barriers to treatment in both high income and low-income countries and continuing further research to determine a cause of PPD is critical to reduce the prevalence of PPD worldwide. Though the prevalence of PPD in the United States has decreased from over 15% in 2004, to less than 12% in 2012, it is still a burden on the economy, the mothers and fathers affected, and especially on a child long term.[7] Deaths from maternal suicide now exceed those due to maternal hemorrhage or hypertensive disorders during pregnancy.[33]Global prevalence is rising as well, and each country faces unique challenges in proper diagnosis and treatment. Identifying PPD as early as possible is necessary, and healthcare providers need to continue to follow the patient after diagnosis to reduce consequences down the road. A validated screening tool with a culturally sensitive cutoff value and properly trained healthcare professionals are the first step in reducing global burden of PPD. The relationship of women's right, human right and postpartum depression is not well studied, however, maternal depression is considered asa threat to human rights[62]. However, more research is necessary to better understand underlying causes and barriers to treatment of postpartum depression.

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