Role of Psycho-Social Factors in Preterm Delivery and Low Birth Weight: A Critical Review

Urmila R. Srivastava*, Manjari Singh** and Madhu Jain***

ABSTRACT

The major objective of the present review is to explicate epidemiological and clinical research evidence linking the role of psycho-social factors in preterm delivery and low birth weight. Data from epidemiological and clinical studies consistently demonstrates that prenatal maternal stress and negative mental health outcomes such as anxiety, depression and somatic health complaints are independent risk factors for preterm delivery and low birth weight. However, a relatively unrecognised methodological issue in studying psycho-social factors during pregnancy is that pregnancy itself presents unique psychological and social challenges. Unfortunately pregnancy specific measures have not been commonly included in studies related to preterm delivery and low birth weight.

Further, the general implications of these findings, like some future research issues demanding attention and clinical intervention programs to reduce the occurrence/incidence of preterm delivery and low birth weight are discussed. The authors have strongly suggested that to reduce the incidence of preterm delivery and low birth weight there is a need to describe

1. Some portion of this manuscript was presented in the National seminar on “Psychological Well-being: Assessment and Issues” (Centre of Advanced Study in Psychology, Utkal University, Vani Vihar, Bhubaneswar, Orissa, 5th to 7th Feb. 07)

* Correspondence concerning this article can be addressed to Dr (Mrs.) URMILA RANI SRIVASTAVA, Lecturer, Department of Psychology, Banaras Hindu University, Varanasi-221005. E-mail: urbhu_24@yahoo.co.in.

** Department of Psychology, B.H.U., Varanasi.

in greater detail the sociocultural, psychological and behavioural influences of mental health during pregnancy.

**Key words:** Preterm delivery, Low birth weight, Psycho-social stress, Pregnancy specific stress, Anxiety and Depression.

Pregnancy is an event that changes many facets of a woman’s life. It is regarded as a time of psychological and biological crisis and emotional upheaval. Pregnancy is perceived by many as a period of happiness in anticipation of motherhood. A more optimistic standpoint views pregnancy as a period that brings marvelous feelings of well being and psychological strength, while others view it simply as a relatively normal and largely positive developmental experience (Brown, 1979; Kelly, 2006).

Considering the fact that about 90% of all women become pregnant at least once in their lives, it seems highly relevant to investigate psychological changes during pregnancy (Geller, 2004; Thorpe, Dragonas, & Golding, 1992). It is the manifestation of various psychological and physiological changes, which leads to a number of problems in psychological adjustment. These difficulties may contribute to emotional disturbance during pregnancy and process of adjustment to anticipated motherhood (Department of Health and Humane Services (US) 2000). Researchers have found that psychological factors influence pregnancy and the long term implications of fetal difficulties during pregnancy (Bloomfield, Oliver, Hawkins, Campbell, Philips, & Gluckman, 2003; Dole, Savitz, Hertz-Picciotto, Siega-Riz, MacMahon, & Buekens, 2003).

Low birth weight (less than 2500 grams), which is the result of preterm delivery or fetal growth retardation, is an important determinant of new born’s health (Copper, Goldenberg, Das, Elder, Ramsey, & Johnson, 1996; Hedegaard, Henriksen, Sabroe, & Secher, 1993; Mohsin, Wong, Bauman, & Bai, 2003; Patel & Prince, 2006). Preterm delivery, defined as a delivery before 259 days or less than 37 weeks gestation, is an obstetrics complication the greatest cause of prenatal mortality and is a major determinant of neonatal morbidity and neurological and neuro-behavioural sequela (Hadders-Algra, Huisjes, & Touwen, 1988; Kaushik, Parmar, Grover, & Kaushik, 1998; Mathews, Menacker, & McDorman, 2003). Moreover, it also has a stressful impact on emotional, social, health and economic aspects of the families (Adams, 1995; Berkowitz, & Papiernik, 1993; Green, Karla-Damus, Simpson, Iams, Reece, & Hobel, 2005; Giscombe & Lobel, 2005).

According to a report on low birth weight, published in Nutritional Policy Paper (2000) Dhaka, (Bangladesh) “prematurity and intrauterine growth retardation are the two main causes of low birth weight. The most cases low

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birth weight in developing countries is due to intrauterine growth retardation, while most cases of low birth weight in industrialised countries are due to preterm birth. In many cases the causes of prematurity are unknown.”

Hence, it has been argued by the current researchers that this is an area of research in which the study of psychological and social variables must be given due importance (Dole et al., 2003; Halbriech, 2004; Mutale, Creed, Maresh, & Hunt, 1991). This approach emphasises the need to describe the sociocultural, psychological and behavioural influences on maternal health during pregnancy in greater detail (Sable & Wilkinson, 2000).

**Psycho-social Factors and Risk of Preterm Delivery and Low Birth Weight**

In recent years a growing interest has been seen in examining the potential etiological association between psycho-social factors and preterm birth. Hence, studies exploring the relationship between psycho-social characteristics and pregnancy outcomes will provide some important information. The present paper also attempts to explicate epidemiological and clinical research evidence linking various psycho-social characteristics and pregnancy outcomes such as preterm delivery and low birth weight.

Psycho-social factors include a wide range of areas related to pregnancy outcomes but the studies in which they are related to pregnancy outcomes are not rigorous and the outcome measures are generally not clear (Goldenberg & Gotlieb, 1991; Kramer, McLean, Boyd, & Usher, 1998). A substantial body of evidence has shown significant association between prenatal maternal stress such as stressful life events, pregnancy-specific stress and adverse birth outcomes such as low birth weight and preterm delivery (DiPietro, Ghera, Costigan, & Hawkins, 2004; Geller, 2004; Halbreich, 2004; Rini, Dunkel-Schetter, Wadhwa, & Sandman, 1999). Researchers have identified numerous risk factors for spontaneous preterm birth, although accurate prediction and prevention remain elusive (Goldenberg, 2002; Iams, 2003; Russel, Pentrini, Damus, Mattison & Schwarz, 2003). Hence, it is evident from these studies that various psycho-social factors are associated with adverse delivery outcomes and there is a need to elaborate the psychological and social factors, which influence the maternal health during pregnancy.

**Role of Stress in Preterm Delivery and Low Birth Weight**

Stress has been the most frequently studied psycho-social factor in pregnancy (deHass, Harlow, Cramer, & Frigoletto, 1991; Nuckolls, Cassel, & Kaplan, 1972). The literature on psycho-social factors and birth outcomes...
predominantly includes the studies addressing life events and various birth outcomes, often with life events measures limited to counts. Only a few studies have measured perception of stress by collecting the women’s assessment of the direction or magnitude of the impact of the events (Bloomfield, et al., 2003; Dole et al., 2003; Lobel, Dunkel- Schetter, & Scrimshaw, 1992).

The term “stress”, however, has two distinct meanings: it is both the occurrence of stressful events (stressors) as well as an individual’s subjective response to those events (felt stress) (Goldenberg & Gotlieb, 1991). Stressful events or stressors are the objective fact, while perceived or felt stress is the subjective response. Stressors are typically measured by life event scale (i.e. the Dohrenwend, Krasnoff, Askenasy, & Dohrenwend, 1978; Holmes & Rahe, 1967) that define the type and frequency of events such as illness of self or family members, deaths, conflict and changes in important relationships, change in place of living, loss or change of employment (Newton, Webster, Binu, Neal, Maskrey, & Phillips, 1979).

Felt stress is thought to be related to changes in the environment, especially negative, unpredictable, and uncontrollable life changes. Felt stress is measured by asking the affected person to rate the intensity of the event that occurred (Hogue, Hoffman, & Hatch, 2001; Viller, Farnot, Barros, Victoria, Langer, & Belizan, 1992).

Stressful life event is also an important risk factor for low birth weight and preterm delivery. It has been defined as an exposure to extraordinary and demanding event such as job loss, which has the capacity to change the pattern of life or arouse very unpleasant feelings (Hogue et al., 2001; Sjostrom, Valentin, Thelin, & Marsal, 2002; Wethington, Almeida, Brown, Frank, & Kessler, 1998). Frequency of stressful life events is found to be directly related to reduced maternal weight gain which has a significant relation to length of gestation, placenta weight and birth weight. It is found that stressful life events experienced during pregnancy are strongly related to emotional disequilibrium and increased risk of low birth weight and preterm delivery (Hedegaard, et al., 1993; Mulder, Roblesde, Huizink, Vanden Bergh, Buitelaar, & Visser, 2002). The risk of very low birth weight is one and one half times greater if the mother perceived that she ‘almost always’ felt stress during her pregnancy

Epidemiological evidence suggests that psycho-social stress is an important contributing as well as an independent risk factor which plays very important role in selected adverse pregnancy outcomes such as low birth weight and
preterm delivery (Bryce, Stanley, & Garner, 1991; Cooper, Murray, Hooper, & West, 1996; Livingston, Otado, & Warren, 2003; Sable & Wilkinson, 2000). A growing body of evidence based on methodologically rigorous studies of pregnant women of different socioeconomic and cultural background supports the premise that mothers experiencing high levels of psychological or social stress during pregnancy are at significantly increased risk of preterm birth (Hedegaard, et al., 1993; Hobel & Culhane, 2003; Rini, et al., 1999; Wadhwa, Sandman, Porto, Dunkel-Schetter, & Garite 1993).

From this foregoing discussion it is clear that, although psycho-social stress is a significant risk factor, not all women reporting high levels of psycho-social stress deliver preterm. Thus, there is a need to assess both the number of stressful events and their intensity or severity while examining the associations of psycho-social stress and preterm delivery and low birth weight (Welberg & Seckl, 2001).

Role of Pregnancy Specific Stress in Preterm Delivery and Low Birth Weight

A relatively unrecognised methodological issue in measuring stress during pregnancy is that pregnancy itself presents unique psychological and social challenges (DiPietro, et al., 2004; Goldenberg, & Gotlieb, 1991; Rini et al., 1999).

Pregnancy specific stress can be defined as maternal fear or anxiety related to pregnancy outcomes, the experience of the labour, the ability to care for a new infant and the health and well-being of the infant (DaCosta, Brender, & Larouche, 1998; Hedegaard et al., 1993; Rini et al., 1999; Yali & Lobel, 1999).

According to Giscombe and Lobel (2005), “pregnancy itself is stressful for some women because it affects her familial, work, and other roles. The compounded demands of these roles, as well as pregnancy’s physical strains, make it a stressful period for a number of women. Pregnancy also requires financial, occupational, familial, and personal adjustments that can lead to emotional distress (pp. 665).”

Pregnant women fear about the health and well-being of their fetus, about the labour and delivery, about medical testing, about changes in lifestyle, and about the responsibilities of motherhood and parenting (DiPietro, et al., 2004; Dunkel-Schatter, Gurung, Lobel, & Wadhwa, 2001; Stanton, Lobel, Sears, & DeLeica, 2002; Yali & Lobel, 1999).
Thus, failure to measure pregnancy specific stress can underestimate maternal distress. Pregnancy specific measures have not been commonly included in studies on birth outcomes related to preterm delivery and low birth weight (DiPietro et al., 2004; Geller, 2004) and effort to develop such scales have identified a wide range of concerns unique to pregnant women (Yali & Lobel, 1999).

The handful of studies that have been carried out in this area show that pregnancy specific stress is significantly and negatively associated with pregnancy outcomes such as low birth weight and preterm delivery. It is emphasised that the occurrence of gestational complications during pregnancy is related to high level of pregnancy specific stress (DaCosta, Larouche, Drista, & Brender, 1999; Geller, 2004), therefore, future research must examine the effect of pregnancy specific stress on low birth weight and preterm delivery.

**Role of Anxiety in Preterm Delivery and Low Birth Weight**

Anxiety is usually a feeling of apprehension, uneasiness, agitation, uncertainty and fear. It can be measured either as an acute response (state anxiety) or a characteristic tendency (trait anxiety). Generally, it includes feelings of tension and apprehension, nervous behaviours, and heightened autonomic system reactivity (DaCosta et al., 1999; Spielberger, Gorush, & Lushene, 1970). Anxiety associated with pregnancy can be compounded by pre-existing difficulties such as having an inadequate social support system.

Pregnancy anxiety can be defined as specific fears and worries related to pregnancy. For most women pregnancy is a time of emotional upheaval. It is common especially in the early weeks to feel anxious and miserable at times. Hormonal changes may add to the feelings of lethargy and dullness (Gurang, Dunkel-Schetter, Collins, Rini, & Hobel, 2005). Most pregnant women experience generalised anxiety surrounding their pregnancy. While a certain amount of anxiety during pregnancy is inevitable, high levels of stress and anxiety can have a detrimental effect on both mother and baby and there is a substantial body of evidence that high levels of anxiety during pregnancy can increase a woman’s risk of miscarriage, preterm or low delivery birth weight (Kelly, 2006; Klebnoff, 2003; Rini, et al., 1999).

A substantial body of research has examined the effect of particular indicators of anxiety on a variety of pregnancy outcomes such as gestational length, birth weight, prepartum and intrapartum complications (Burstein, Kinch, & Stern, 1974; Crandon, 1979; Levin & DeFrank, 1988; DiPietro, et al., 2004).

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Commenting over the issue, several studies have shown a strong link between maternal anxiety levels early in pregnancy and child’s susceptibility to attention deficit hyperactivity disorder (ADHD) years later (Gurang, et al., 2005; Kelly, 2006). Further, it has been reported by a few studies that prevalence of various anxiety disorders among pregnant women has been estimated at 10% (Beck, 2001; Dole, et al., 2003).

In spite of the apparent consistency of findings, the conclusiveness of this relationship between anxiety and pregnancy outcomes is hampered by several factors. In general the studies have used State, Trait Anxiety Inventory (Spielberger, Gorush, & Lushene, 1970) and Manifest Anxiety Inventory (Taylor, 1953) to measure anxiety and such instruments measure general anxiety only, which is not adequate for measuring pregnancy specific anxiety. As a result both the reliability of measures and concomitant validity of findings linking anxiety to pregnancy outcomes are uncertain. The studies in general have shown that the strongest predictor of gestational length and preterm delivery is a new variable “pregnancy anxiety” (Dunkel-Sehetter, 1998; Klebnoff, 2003; Sheehan, 1996).

In a comprehensive study on the association between pregnancy specific anxiety and the risk of preterm birth, Rini, et al. (1999) have concluded that both general and pregnancy specific anxiety, independently contributed to the risk of shortened gestation. These authors have strongly commented that pregnancy anxiety should be regarded as a relatively distinctive syndrome. Its measurement can make a unique contribution to the evaluation of anxiety during pregnancy (Brook, Anderson, Bland, Peacock, & Stewart, 1989; Gorsuch & Key, 1974; Peacock, Bland, & Anderson, 1995).

Anxiety during pregnancy is a critical obstetric concern because of its potential impact on the well being of a mother and her child. However, research has provided contradictory evidence on the usefulness of prenatal measures and anxiety in predicting the subsequent course of labour and delivery (Beck, Siegel, Davidson, Kormeier, Breitenstein, & Hall, 1980; Standley, Soule, & Copans, 1979). Anxiety has usually been considered as a general construct and in previous studies, possible foci of anxiety, the fetus, the impending childbirth, and the demand of the infant care have been ignored.

Thus, it becomes apparent from the above mentioned review of literature that pregnancy related anxiety is a unique concept but until now general anxiety indices have been used to predict birth outcomes and postnatal development of children (Allen, Lewinshon, & Seeley, 1998; Dorn, Susman, & Petersen, 1993; McCool, Dorn, & Susman, 1994). However, the aspects of...
pregnancy specific anxiety have been so far ignored and now require more attention by the researchers.

**Role of Depression in Preterm Delivery and Low Birth Weight**

For too many women with joyful anticipation pregnancy and motherhood bring depression as an unexpected accompaniment. Depression during pregnancy may result in poor prenatal care, premature delivery, low birth weight and a possible depression in the new born (Evans, Heron, Francomb, Oke, & Golding, 2001).

Depression is a mood/mental state that causes an individual to feel extreme sadness. Depression is a fairly common condition, it is thought to affect at least one in four women at some time in their life. Depression and depressive symptoms have important clinical implications for the health status of the mother during pregnancy. Depression that occurs during pregnancy is a particular concern because it can affect the health of both mother and her baby (Finch, 2003; Peindl & Jefferson, 2004).

In other words, it can be said that depression is a serious medical illness that has a negative effect on how someone feels, thinks and acts. The most common symptoms of depression are anxiety, irritability, fatigue and thoughts of death or self harm (Bennett, Einarson, Taddio, Koren, & Einarson, 2004). Recent studies, (Bonari, Bennett, Einarson, & Koren, 2004; Zelkowitz, Schinazi, Katofsky, Saucier, Valenzuela, Westreich, & Dayan, 2004) have substantially indicated that pregnant women with untreated depression are likely to experience: preterm birth, spontaneous abortion and gestational hypertension.

The chance for a woman to develop depression during her lifetime is about 10-25 %. The highest risk occurs during her childbearing years and pregnancy may be a trigger for the development of depression in some women. This may be due to a change in hormone levels during pregnancy (Cohen, Altshuler, Harlow, Nonacs, Newport, & Viguera, 2006; Seguin, Potvin, St Denis, & Loiselle, 1995).

As anxiety and stress, depression has also been reported to cause negative pregnancy outcomes. Even depression as early as in the first trimester of pregnancy has been found to be associated with high risk of preterm delivery and low birth weight.

Recent studies have reported positive association between spontaneous preterm birth and depression (Beck, 2001; Dayan, Creveuil, Herlicoviez, Herbel, & Baranger, 2002; Hoffman and Hatch, 1996). In a very recent study, Rahman,
Iqbal, and Harrington (2003) have demonstrated that the high rates of depression were associated with preterm birth and ignoring depression during pregnancy can be risky for both mother and child. Depressed mothers often take poor care of themselves. They may smoke, drink or neglect proper diet (Glover, & O’Connor, 2002; Zukerman, Amaro, Bauchner, & Cabral, 1989). Studies have further shown that depression during pregnancy is associated with legal and illegal substance abuse as a means of coping with their depression (Halbriech, 2004; McLean, Minkovitz, Strobino, Marks, & Hou, 2006).

In one study Evans, et al., (2001) have found that almost 25% cases of postpartum depression start during pregnancy and may reach their peak at that time. In pregnant women the experience of depression is often overlooked partly because of a wide spread misconception that pregnancy somehow provides protection against mood disorders.

Although depression is very common in women during pregnancy only a few studies have evaluated the impact of maternal depression on pregnancy outcomes. So, there is a need to improve the understanding of the relation between maternal prenatal depression and preterm birth (Dayan, et al., 2002; Rahman, et al., 2003; Teixeira, Fish, & Glover, 1999; Weissman, & Olfson, 1995).

Thus, it is clear from the above mentioned review of literature that various psycho-social factors are associated with adverse pregnancy outcomes. Contemporary researchers have consistently recommended that this is an area of research in which the study of psychological and social variables must be studied in conjunction with the biological ones. Further research in this area will certainly make a major contribution in improving adverse pregnancy outcomes by taking into account specificity in the definition and measurement of both psycho-social factors and pregnancy outcomes (Cogill, Caplan, Alexandra, Robson, & Kumar, 1986; Dole, et al., 2003; Halbriech, 2004; Mutale, et al., 1991).

**Implications, Interventions and Suggestions for the Future Research**

The major implications of these findings indicate that a number of risk factors for preterm delivery and low birth weight are strongly related to the psycho-social status of women and not only with obstetric and medical risk factors. Explaining the epidemiological relationship between psycho-social factors and pregnancy outcomes and defining the mechanisms for these effects will allow us to make a major impact on improving pregnancy outcomes for women and their infants. Furthermore, reducing the maternal stress may
yield good pregnancy outcomes, as the effect of maternal stress on the postnatal environment that is created for the infant, has greater consequence than the biological effects of prenatal exposure.

On the basis of these findings, two potential areas of interventions are strongly recommended. First, addressing issues that contribute to the stress in pregnancy, and second, providing counseling and information on behavioural risks associated with preterm delivery and low birth weight.

Given the fact that stress influences birth weight of babies, interventions should apply for pregnant women as early in the gestation as possible to cope effectively with specific stressful situations. Reduction of preterm delivery holds a greater promise for reducing infant’s illness, disability and death. The success of intervention programs to reduce the high rates of mortality and morbidity associated with preterm delivery and low birth weight depends on a more comprehensive understanding of the role of and mechanisms by which medical, psychological and social factors cause adverse birth outcomes. An initial psycho-social assessment of pregnant women should include their level of stress, life circumstances and attitudes and intention about the pregnancy. Interventions with pregnant women, including those that assess stress and pregnancy attitudes, have the potential to improve pregnancy outcomes.

From this foregoing discussion, we have identified the following knowledge gaps illustrated in the literature and suggested the following avenues for future research.

First, the literature showing an association between stress and preterm birth, largely limited to individual level, psycho-social definitions and measurements of stressful experiences. Therefore, future research must incorporate multiple psycho-social domains, information about the women’s social environment, life circumstances and resources through which stress operates (Magadi, Madise, & Diamond, 2001; Midhet, Becker, & Berendes, 1998).

Second, the available studies in general have used measures of only general anxiety and general stressful life events to predict adverse birth outcomes. Pregnancy specific measures have not been commonly included in the studies on preterm delivery and low birth weight. So, the effect of pregnancy specific stress and anxiety on these outcomes should be taken into consideration by the future researchers.

Third, although, depression is very common in women during pregnancy only a few studies have evaluated the impact of prenatal maternal depression
on pregnancy outcomes. So, there is a need to improve the understanding of the relation between maternal prenatal depression and preterm birth.

In conclusion, a comprehensive multilevel approach that incorporates the important consequences of psycho-social factors on pregnancy outcomes will certainly advance this field of research and further sharpen our understanding of the role of psycho-social factors in pregnancy. Future research must examine the complex emotional processes and their concomitants during pregnancy and consider prenatal interventions for women to reduce risk for adverse emotional and medical outcomes.

REFERENCES


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