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IMPACT OF THE PSYCHOLOGICAL STRESS ON MISCARRIAGE

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ABSTRACT

Spontaneous pregnancy loss is the most common complication of pregnancy1, 2; it occurs before 24 weeks of gestation in around 20% of pregnancies3–5 and in 12–15% of clinically recognized pregnancies6. However, many cases of miscarriage are unreported; especially those involving early fetal loss, so the incidence may be even higher7. Only a small proportion (<10%) of women who experience miscarriage report recurrent pregnancy loss7 and as many as a third of pregnancy losses are not linked to chromosomal abnormalities5. Miscarriage is often associated with high levels of distress for women. Many systematic reviews and meta-analysis were designed to investigate whether maternal psychological stress and recent life events are associated with an increased risk of miscarriage. A literature search was conducted to identify studies reporting miscarriage in women with and without history of exposure to psychological stress (the only Exposure considered). The search produced 1978 studies; 8 studies were suitable for analysis. A meta-analysis was performed using a random-effects model with effect sizes weighted by the sampling variance. The risk of miscarriage was significantly higher in women with a history of exposure to psychological stress These findings remained after controlling for study type (cohort and nested case-control study exposure types types of controls included). We found no evidence that publication bias or study heterogeneity significantly influenced the results. Our finding provides the most robust evidence to date, that prior psychological stress is harmful to women in early pregnancy.

KEYWORDS: Psychological stress, Miscarriage, Pregnancy.

INTRODUCTION

Abortion is the ending of pregnancy due to removing an embryo or fetus before it can survive outside the uterus. An abortion that occurs spontaneously is also known as a miscarriage. When deliberate steps are taken to end a pregnancy, it is called an induced abortion, or less frequently as an "induced miscarriage". The word abortion is often used to mean only induced abortions. A similar procedure after the fetus could potentially survive outside the womb is known as a "late termination of pregnancy" or less accurately as a "late term abortion".

Types

Induced

- An induced abortion may be classified as therapeutic (done in response to a health condition of the women or fetus) or elective (chosen for other reasons).
- Approximately 205 million pregnancies occur each year worldwide. Over a third are unintended and about a fifth end in induced abortion.
- Most abortions result from unintended pregnancies. In the United Kingdom, 1 to 2% of abortions are done due to genetic problems in the fetus.
- A pregnancy can be intentionally aborted in several ways. The manner selected often depends upon the gestational age of the embryo or fetus, which increases in size as the pregnancy progresses. Specific procedures may also be selected due to legality, regional availability, and doctor or a woman's personal preference.
- Reasons for procuring induced abortions are typically characterized as either therapeutic or elective. An abortion is medically referred to as a therapeutic abortion when it is performed to save the life of the pregnant woman; to prevent harm to the woman's physical or mental health; to terminate a pregnancy where indications are that the child will have a significantly increased chance of mortality or morbidity; or to selectively reduce the number of fetuses to lessen health risks associated with multiple pregnancy.

Spontaneous

- Spontaneous abortion, also known as miscarriage, is the unintentional expulsion of an embryo or fetus before the 24th week of gestation.

- A pregnancy that ends before 37 weeks of gestation resulting in a live-born infant is known as a "premature birth" or a "preterm birth". When a fetus dies in utero after viability, or during delivery, it is usually termed "stillborn". Premature births and stillbirths are generally not considered to be miscarriages although usage of these terms can sometimes overlap.
- Only 30% to 50% of conceptions progress past the first trimester. The vast majority of those that do not progress are lost before the woman is aware of the conception, and many pregnancies are lost before medical practitioners can detect an embryo.
- Between 15% and 30% of known pregnancies end in clinically apparent miscarriage, depending upon the age and health of the pregnant woman. 80% of these spontaneous abortions happen in the first trimester.
- The most common cause of spontaneous abortion during the first trimester is chromosomal abnormalities of the embryo or fetus, accounting for at least 50% of sampled early pregnancy losses. Other causes include vascular disease (such as lupus), diabetes, other hormonal problems, infection, and abnormalities of the uterus.
- Advancing maternal age and a woman's history of previous spontaneous abortions are the two leading factors associated with a greater risk of spontaneous abortion. A spontaneous abortion can also be caused by accidental trauma; intentional trauma or stress to cause miscarriage is considered induced abortion or feticide.

Causes

- Two-fold increase in miscarriage was found in women with a history of exposure to psychological stress.
- Stress (e.g. financial or marital problems, death, divorce, physical and nonphysical abuse inflicted on a woman by her partner and loss of social support) was also associated with the likelihood of miscarriage among women reporting to an emergency department or admission to hospital.
- The belief that stress at the time of conception or during pregnancy can harm their baby, causing problems such as miscarriage, is widely held amongst women.

Psychological challenges can include

- Experience of emotional trauma,
- Social problems,
- Concerns about money, marital/partnership disharmony, work pressure,
- Significant change in personal circumstances as well as prior pregnancy loss.

Risk Factors

- For example, 76% of women attending an antenatal clinic in the USA, thought that a mother's stress can negatively affect pregnancy outcome, with 35% believing that pregnant women should avoid upsetting things like violent programs or funerals.
- Women in that study were interpreting the term "stress" in its psychological form i.e. they experience negative emotionality when their physical or psychological well-being is threatened.
- Some doctors and midwives share this view although they know that fetal chromosomal abnormality is present in around two thirds of cases of early pregnancy failure.

Other risk factors for miscarriage include

- Increased maternal age,
- Obesity
- Caffeine
- Alcohol
- Cigarette smoke
- Exercise

Mechanism

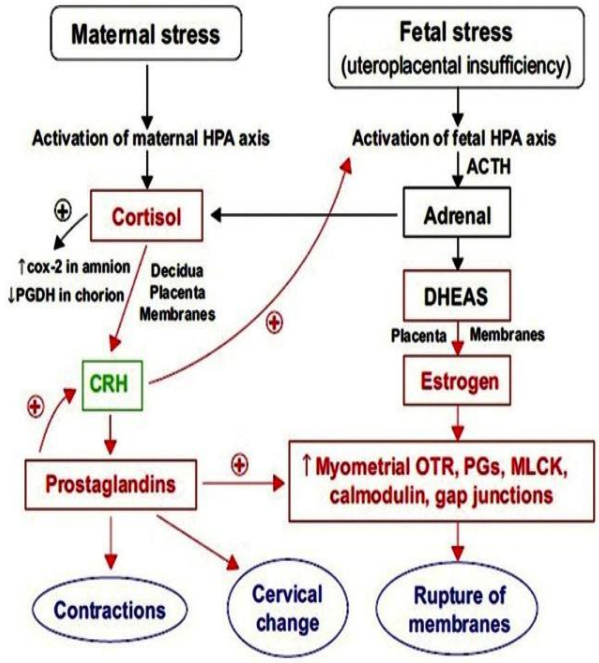

Fig. 1: Represents the mechanism of stress induced abortion.

Adverse Effects of Stress in Pregnancy

- Pregnancy induced Hypertension
- Pregnancy induced Diabetes
- Abortion
- Eclampsia
- Preterm labour
- Intrauterine growth restriction.

Signs and Types

Most of the time, miscarriage is a process instead of a single event. There are several types of miscarriage your healthcare provider may refer to, each with its own set of signs:

- Threatened miscarriage: accompanied by uterine bleeding, cramping and backache.
- Incomplete miscarriage: abdominal and back pain accompanied with bleeding and an open cervix.
- Complete miscarriage: when the embryo or fetus has exited the uterus. It can be completed by an ultrasound or surgical curettage.
- Missed miscarriage: occurs during embryonic death. Often times, there are no signs or symptoms of miscarriage, and the loss of pregnancy would not be confirmed until the absence of fetal heart beats from an ultrasound.
- Recurrent miscarriage: defined by three or more consecutive, first trimester carriages.
- Blighted ovum: it is possible for a fertilized egg to attach to the uterus wall, but fail to have any fetal growth.
- Ectopic pregnancy: this happens when a fertilized egg implants itself outside of the uterus, usually in the fallopian tube. This is a serious condition and should be treated immediately to avoid further complications for the mother.
- Molar pregnancy: this is due to a genetic error during fertilization, which leads to abnormal tissue growth in the uterus.

Symptoms

Signs and symptoms of a miscarriage may include:

- Vaginal spotting or bleeding (color can range from pink, to red, to brown)
- Tissue or fluid passing from the vagina
- Cramps, abdominal pain, or back pain

Risks

- Damage to the womb or cervix.
- Uterine perforation
- Excessive bleeding
- Infection of the uterus or fallopian tubes
- Scarring of the inside of the uterus
- Reactions to the medicine or anesthesia.

Prevention

- While there is little that can be done about genetically-related miscarriages, there are still steps a woman can take to minimize all other potential risks for pregnancy loss. Here are some suggestions:
- Exercise
- Adopt a healthy, nutritious diet
- Stress management
- Keep a healthy weight
- Take care of any pre-existing medical conditions
- Take folic acid and/or prenatal vitamins
- Quit smoking
- Stop excessive alcohol intake
- Speak to your doctor about fertility testing and tips to prepare for pregnancy.

During the pregnancy, be sure to

- Stay out of second hand smoke areas
- Avoid or limit exposure to toxic environments, such as fumes, chemical leaks, or radiation
- Limit caffeine intake
- Avoid heavy-duty contact sports
- Protect the abdomen area
- Adopt a pregnancy-healthy diet

Management

- When a woman experiences a miscarriage, the main goal of the healthcare provider is to prevent infections, stop bleeding, and expel all tissues to ensure the mother's health. Depending on the type and stage of miscarriage, there are different types of treatment, ranging from simply taking medication to surgery. It is important to monitor and manage the pregnancy loss as directed by the doctor after confirmation.
- After a miscarriage, emotional and psychological healing may take more time than physical healing. Do not be afraid to reach out to your loved ones or a hotline for support, and heal at your own pace. If you are feeling symptoms of depression or extreme psychological distress, be sure to contact your doctor for further steps of management. When you are ready to get pregnant again, consult a fertility specialist or your healthcare provider to even better prepare against miscarriage in the future.

Treatment

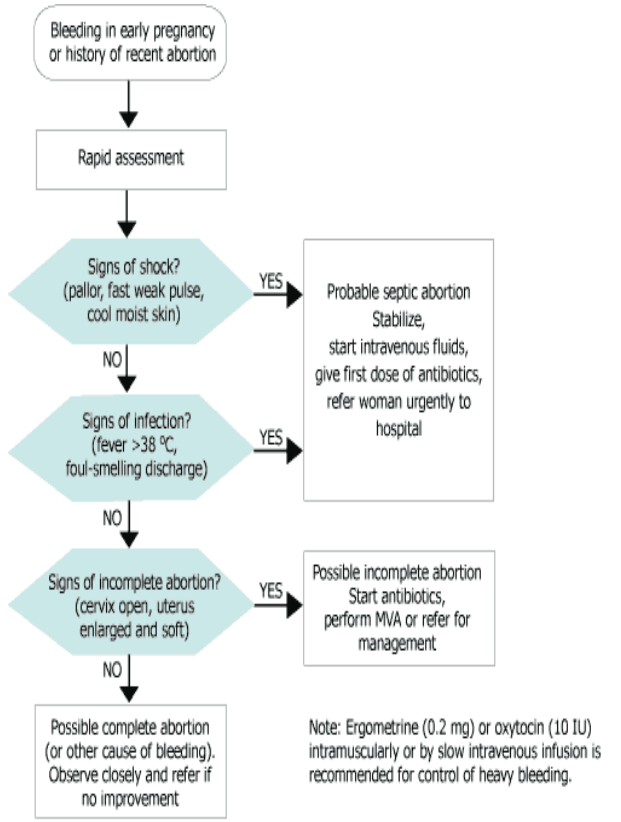

Fig. 1(a): Represents the treatment procedure for stress induced abortion.

RESULTS FROM VARIOUS SYSTEMIC REVIEWS AND META ANALYSIS

Characteristics of included studies

The search strategy produced 1978 studies; of which, 1896 studies with irrelevant title and/or abstract were excluded. Full text papers were retrieved for 82 studies and 74 studies were further excluded in compliance with the criteria defined in methods section. A final number of 8 studies were included for the meta-analysis. Characteristics of all studies included in the systematic review were shown as Table 1. Of the 8 included studies, 4 are case-control studies, 3 are cohort studies, and 1 is a nested case-control study. The sample size in these studies ranged from 96 to 6945. All of the 8 included studies reported odds ratio (OR) with 95% confidence interval (CI) as the outcome measure of the association between psychological stress and miscarriage1, 2, 7, 8, 10, 11, 13, 23.

Effect size analysis

We evaluated for the outliers before starting the analysis, and found no extreme values. As presented in Fig. 2, the overall pooled OR was 1.42 (95% CI 1.19 to 1.70) with moderate heterogeneity (I2=35.6%), indicating that maternal psychological stress is significantly associated with an increased risk of miscarriage.

Subgroup analysis was conducted to explore the sources of the heterogeneity (presented in Table 2). There was positive association between psychological stress and miscarriage for the type of study (OR: 1.69 for case-control studies; 1.33 for cohort and nested case-control study).However, the OR was statistically significant only for cohort and nested case-control studies (OR, 1.33; 95% CI, 1.14–1.54; P<0.001.

Moreover, substantial heterogeneity (I2=62.1%) was reported for case-control studies, whereas for cohort and nested case-control study, heterogeneity was low (I2=0.0%). Exposures in the included studies were divided into three types: psychological stress, life events and work stress. In terms of subgroup analysis based on exposure factors, we found that there was no heterogeneity (I2=0.0%) between studies concerning work stress7, 13, 23. We found that work stress was significantly associated with an increased risk of miscarriage (OR, 1.27; 95% CI, 1.10–1.47; P=0.001).

In subgroup analysis according to the types of controls, psychological stress was observed to have the greater impact on miscarriage when the comparison group consisted of women who had a live birth (OR, 2.82; 95% CI, 1.64–4.86; P<0.01).

We further categorized the eight included studies by NOS scores; heterogeneity decreased (I2=21.7%) when the two lower quality studies were excluded1, 13. After removing the study not controlling for potential confounding factors,[1] the pooled OR slightly decreased to 1.34 (95% CI 1.16 to 1.54; I2=9.2%). Results from sensitivity analysis (i.e. excluding one study at a time) demonstrated that none of the studies caused significant heterogeneity compared with the rest, or strongly influenced the results.

Table 1: Characteristics of all studies included in the systematic review. Note: NOS: Newcastle-Ottawa Scale; OR: Odds Ratio; CI: confidence interval; ND: Not Described; BMI: Body Mass Index.

First author, year published	Country	Year	Design	Total sample size	Sample size related to our meta-analysis	Exposures	Reference group	Stress measurement	Effect estimates	Matched or adjusted confounders	NOS score
Meaney S[2]	Ireland	2012	Cohort	417	417	Psychological stress	Women maintained their pregnancy	Questionnaires and psychometric tests (detailed lifestyle questionnaires, including common risk factors for miscarriage, and psychometric tests, including the 36-Item Health Survey, the Maternity Social Support Scale, the Revised Life Orientation Test and the Perceived Stress Scale).	OR	ND (without detailed description of the adjusted confounders)	7
Nelson DB[10]	USA	1999–2000	Case-control	326	326	Psychological stress	Women maintained their pregnancy	Perceived Stress Scale; Prenatal Social Environment Inventory; Index of Spousal Abuse.	OR	Maternal age, gestational age, cigarette and cocaine use, prior spontaneous abortion	8
O'Hare T[11]	UK	ND	Case-control	96	96	Life events	Women giving birth in hospital	Life Events and Difficulties Schedule (the women were interviewed in hospital).	OR	Age, marital status, social class distribution, woman's or partner's employment status, numbers of children or adults in household, obstetric history	8

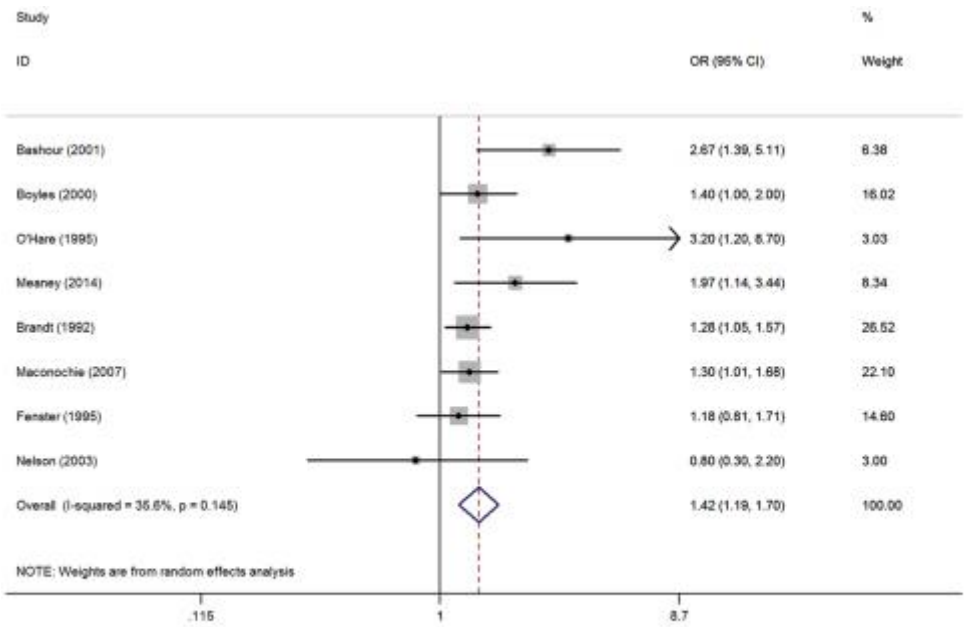

Figure 2. Meta-analysis of eight studies about the effect of maternal psychological stress on miscarriage. (note: OR, odds ratio; CI, confidence interval).

Table 2: Results of subgroup analyses Note: OR: Odds Ratio: CI: confidence interval: *p value for hetertgeneity.

Factor	Number of studies	OR (95% CI)	P Value	I^2(%), p Value*
Study type				
Case-control	4	1.69 (0.99 to 2.88)	0.054 < 0.001	62.1, 0.048
Cohort + Nested case-control	4	1.33 (1.14 to 1.54)	<0.001	0.0, 0.464
Exposures				
Psychological stress	3	1.80 (1.01 to 3.19)	0.045	49.5, 0.138
Life events	2	1.85 (0.86 to 3.97)	0.116	58.1, 0.123
Work stress	3	1.27 (1.10 to 1.47)	0.001	0.0, 0.911
Control (Miscarriage vs)				
Live birth	2	2.82 (1.64 to 4.86)	<0.001	0.0, 0.765
Ongoing pregnancy	5	1.33 (1.12 to 1.57)	0.001	0.0, 0.485
Undefined	1	1.28 (1.05 to 1.57)	0.016	—
Quality of studies				
Low	2	1.73 (0.85 to 3.51)	0.130	77.6, 0.034
High	6	1.38 (1.13 to 1.70)	0.002	21.7, 0.270
With/without adjusted confounders				
With	7	1.34 (1.16 to 1.54)	<0.001	9.2, 0.358
Without	1	2.67 (1.39 to 5.12)	0.003	—

CONCLUSION

- Psychological stress can influence well-being through associated health-impairing behaviors and through physiological responses which affect vascular, immune, metabolic or Neuroendocrinefunctions.[24] The experience of stress can originate in a wide range of circumstances and is defined as "any situation that overwhelms our ability to cope".[25] Therefore, the experience of stress varies, not only by an individual's internal resources but also by the social and material support which is available to them.
- Effects are difficult to assess as physiological responses to stress vary with its intensity and duration, and are contingent on the genetic vulnerability and life history of the affected individual.[26] For example, the degree of stress experienced in infancy and childhood have

implications for the individual's subsequent physiological response to stress.

- The results of this meta-analysis support the belief that psychological stress before and during pregnancy is associated with miscarriage. A view held by some medical practitioners and around three quarters of pregnant women, but most often dismissed by doctors and other health care professionals. Whilst chromosomal abnormalities underlie many cases of early pregnancy loss, the present results show that these psychological factors can increase the risk by approximately 42%.

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