**Journal of Medical and Health Studies**
ISSN: 2710-1452
DOI: 10.32996/jmhs
Journal Homepage: www.al-kindipublisher.com/index.php/jmhs

JMHS
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**| RESEARCH ARTICLE**

# The Relationship between Infant Prematurity and Parental Anxiety: A Systematic Review

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**| ABSTRACT**

Prematurity refers to the birth of a baby before 37 completed weeks of pregnancy. This can be related to considerable parental anxiety and mental status changes. Anxiety can manifest as worrying thoughts, feelings of tension, and altered vital signs. This review aims to analyze the relationship between premature birth and parental anxiety, focusing on the emotional status of both mothers and fathers. The review was performed using the Preferred Reporting Items for Systematic Reviews and Meta-Analysis 2020 guidelines. A search was undertaken in PubMed, PubMed Central, MEDLINE, and ScienceDirect. Screening of articles was carried out to find relevant and appropriate articles. Articles were then quality-checked before inclusion. Our analysis showed that mothers of preterm infants had greater symptoms of anxiety, and comorbid anxiety and depression, than mothers of term infants. Mothers of preterm infants 5 years after discharge showed long-term consequences of stress and anxiety, including inappropriate responses and reduced praise for their children. Mothers of preterm multiples were more likely to experience stress and anxiety than mothers of preterm singletons. Fathers of preterm infants experienced higher levels of stress than fathers of term infants, but fathers of preterm infants experienced less stress than mothers of preterm infants. These findings suggest that routine mental health screening and intervention should be undertaken for both mothers and fathers of preterm infants.

**| KEYWORDS**

Infant, Infant, Newborn, Infant, Premature, Infant, Extremely Premature, Infant, Low Birth Weight, Infant, Small for Gestational Age, Infant, Very Low Birth Weight

**| ARTICLE INFORMATION**

**ACCEPTED:** 01 July 2022 **PUBLISHED:** 13 July 2021 **DOI:** 10.32996/jmhs.2022.3.3.5

## 1. Introduction

The birth of a preterm baby can be associated with stress and anxiety for the parents. We must understand what the parent is going through since it is likely that there will be some associated discomfort and anxiety. The first time a parent sees his/her premature baby, they can feel a "rollercoaster of emotions" and can feel both elated and devastated [Arnold, 2013]. First-time parents of premature babies admitted to the neonatal intensive care unit (NICU) can feel "overwhelmed and terrified" by the medical equipment and the surroundings [Vazquez, 2014]. Unfortunately, this is the reality for many parents.

Some previous inquiries into this area were able to evaluate mothers of premature infants, which showed varying degrees of anxiety [Celen, 2017]. One study showed that mothers with premature babies hospitalized in the NICU had high levels of anxiety, and showed that this was related to factors such as hospitalization of the new-born for a prolonged period, inability to physically care for the neonate, and a general lack of information relating to the health of the baby [Mizrak, 2015].

Research on this topic is evolving and ongoing, and it is thereby necessary for research to be continuously performed to evaluate the changing needs of parents. It is important to understand the emotional capacity of parents and how their babies' prematurity affects them. This review aims to analyze the relationship between premature birth and parental anxiety, focusing on the emotional status of both parents. By understanding this, we can then be able to use this information to formulate policies backed by evidence,

to treat parents' emotional needs. Furthermore, by establishing this foundation, future research can build on this review so they may be better able to evaluate the parental perspective of their premature babies.

## 2. Methodology

This review adheres to the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) 2020 standards [Page, 2021].

### *2.1 Search Strategy and Data Extraction*

The databases PubMed, MEDLINE, PubMed Central (PMC), and Science Direct were searched to find full-text relevant and peer-reviewed articles. These were searched using predetermined keywords and Medical Subject Headings (MeSH) terms to find potentially relevant articles. The MeSH strategy used in PubMed was: ( "Premature Birth/analysis"[Mesh] OR "Premature Birth/anatomy and histology"[Mesh] OR "Premature Birth/blood"[Mesh] OR "Premature Birth/classification"[Mesh] OR "Premature Birth/diagnosis"[Mesh] OR "Premature Birth/epidemiology"[Mesh] OR "Premature Birth/etiology"[Mesh] OR "Premature Birth/mortality"[Mesh] OR "Premature Birth/pathology"[Mesh] OR "Premature Birth/physiology"[Mesh] OR "Premature Birth/physiopathology"[Mesh] OR "Premature Birth/prevention and control"[Mesh] OR "Premature Birth/statistics and numerical data"[Mesh] ) AND parental anxiety. For other databases, the keywords used included parental anxiety and premature birth.

### *2.2 Inclusion and Exclusion Criteria*

The papers were filtered to include only those papers which fell into the following pre-defined criteria: a peer-reviewed publication, from 2017-2022, in humans, in the English language, with the full-text available, in the field of "Medicine and Dentistry". Papers that did not fall into these criteria were gray literature or irrelevant were not included.

### *2.3 Quality Appraisal*

The selected articles were subjected to quality assessment by the relevant techniques. To assess observational studies for any possible bias, the Newcastle Ottawa Scale [Ottawa Hospital Research Institute, 2022] was used, and the Joanna Briggs Institute (JBI) Critical Appraisal Checklist [Moola, 2020] was used for analytical cross-sectional studies. Tables 1 and 2 illustrate the quality assessment of the articles. Articles were included in the review once they met a minimum quality check of 70%.

**Table 1: Quality Assessment of Cohort Studies using the Newcastle Ottawa Scale**

| | | [Cajiao-Nieto et al., 2021] | [Gerstein et al., 2019] |
|---|---|---|---|
| SELECTION | Representativeness of the Exposed Cohort | ✓ | ✓ |
| | Selection of the Non-Exposed Cohort | ✓ | X |
| | Ascertainment of Exposure | ✓ | ✓ |
| | Demonstration That Outcome of Interest Was Not Present at Start of Study | ✓ | ✓ |
| COMPARABILITY | Comparability of Cohorts on the Basis of the Design or Analysis | ✓✓ | ✓✓ |
| OUTCOME | Assessment of Outcome | ✓ | ✓ |
| | Was Follow-Up Long Enough for Outcomes to Occur | ✓ | ✓ |
| | Adequacy of Follow Up of Cohorts | ✓ | ✓ |
| | SCORE (out of 9) | 9 | 8 |

**Table 2: Quality Assessment of Cross-Sectional Studies using the JBI Critical Appraisal Checklist**

| | | [Baptista et al., 2018] | [Harris et al., 2018] | [Mutua et al., 2020] | [Værland et al., 2017] | [Al Maghaireh et al., 2017] | [Fernández Medina et al., 2018] |
|---|---|---|---|---|---|---|---|
| SELECTION | Were the criteria for inclusion in the sample clearly defined? | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| | Were the study subjects and the setting described in detail? | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| | Was the exposure measured in a valid and reliable way? | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| COMPARABILIT | Were objective, standard criteria used for measurement of the condition? | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| | Were confounding factors identified? | ✓ | ✓ | ✓ | X | X | ✓ |
| EXPOSURE | Were strategies to deal with confounding factors stated? | ✓ | ✓ | ✓ | X | X | X |
| | Were the outcomes measured in a valid and way? | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| | Was appropriate statistical analysis used? reliable | ✓ | ✓ | ✓ | X | ✓ | X |
| SCORE (out of 8) | | 8 | 8 | 8 | 5 | 6 | 6 |

**3. Results and Findings**

A total of 6,143 published papers were found utilizing the initial search criteria. After automatic filters were applied, the databases reported a total of 1,152 published papers. A total of 4 duplicates were removed before the screening began. After screening the titles for relevance, the list of relevant articles was narrowed down to 79. The abstracts of these 79 articles were then thoroughly perused to determine relevance, of which 33 moved forward to the next stage. Of these 33 articles, it was not possible to obtain the full text of 2 articles, and these were eliminated. The full texts of these remaining articles were then thoroughly read to determine the level of relevance. There were a total of 8 full-text articles determined to be relevant to the topic. However, one of these articles [Værland et al., 2017] was found to be of insufficient quality to be included and was eliminated. The systematic review thus included a total of 7 articles. *Figure 1* illustrates the PRISMA 2020 flow chart of article identification and stages of the systematic review.

**Figure 1: PRISMA Flowchart demonstrating the process of article selection**
(PRISMA = Preferred Reporting Items for Systematic Reviews and Meta-Analysis)

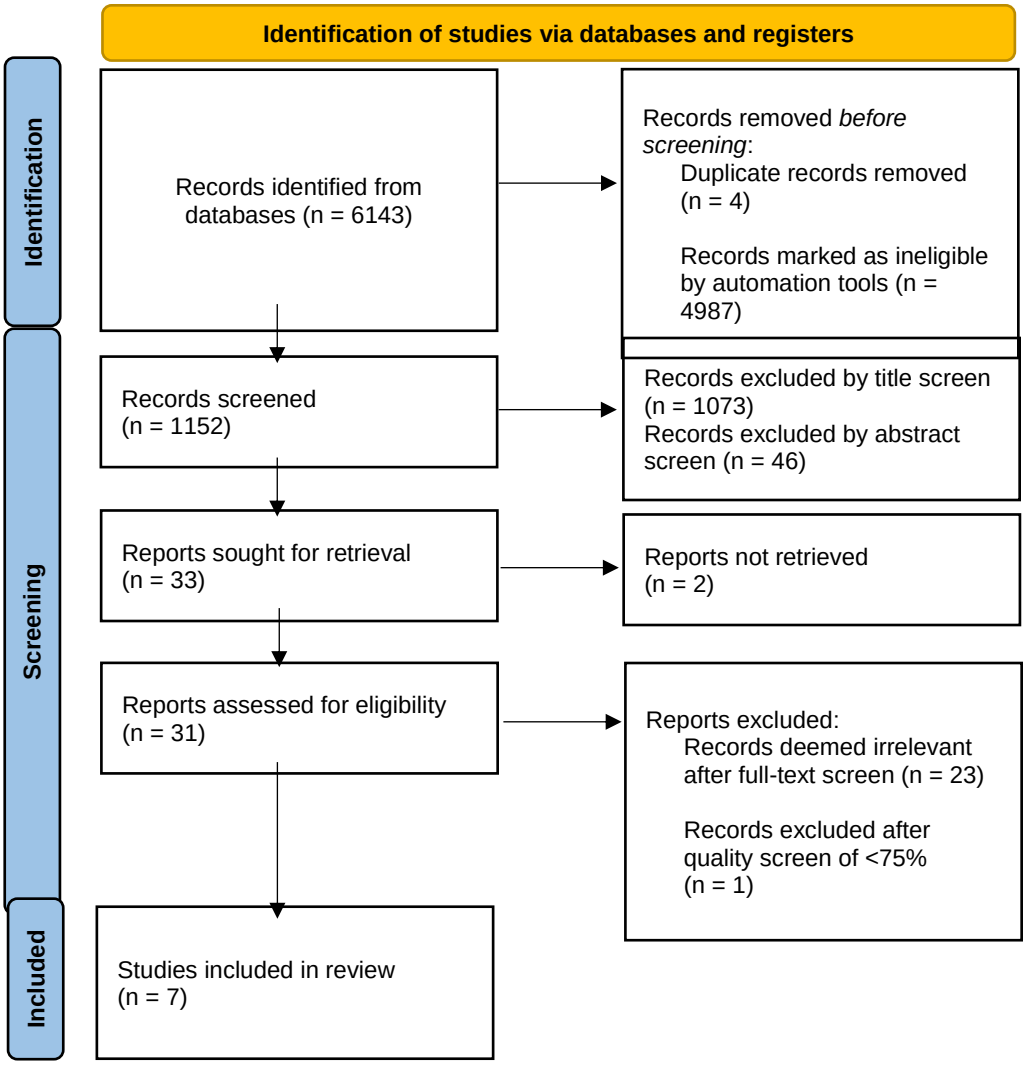

**Table 1: Baseline Characteristics of Included Studies**

| Author and Year of Publication | Parent population | Infant population | Outcome being studied | Findings |
|---|---|---|---|---|
| [Baptista J et al., 2018] | 95 Mothers | Preterm multiples, preterm singletons | Maternal stress and psychological effects | Mothers with preterm multiples reported higher levels of stress and more psychological symptoms than mothers of preterm singletons. |
| [Cajiao-Nieto et al., 2021] | 84 fathers (51 study population, 33 control) | 69 infants in the study group (63.8% 32-36 weeks GA) | Anxiety and depression | Hospitalization of infants increases the risk of paternal anxiety or depression |
| [Gerstein et al., 2019] | 62 mothers | 74 preterm infants | Depression and stress | Mothers exhibited peripartum depression and stress which lead to impacts on parenting behaviors |
| [Harris R et al., 2018] | 84 mothers (37 mothers of preterm infants and 47 of full-term infants) | Preterm infants, term infants | Psychological welling being, transition to parenting, NICU visitation, involvement in care | 70% of mothers of preterm babies experienced psychological distress compared to 60% of mothers of term babies. Lower birthweight was also associated with increased psychological distress. |
| [Al Maghaireh et al., 2017] | 310 parents | 118 preterm, 37 term | Stress, anxiety, depression, sleep disturbance | Mothers experienced higher levels of stress than fathers |
| [Fernández Medina et al, 2017] | 16 mothers | Extremely preterm infants | Psychological status | Feelings of emptiness and emotional crisis |
| [Mutua et al., 2020] | 172 mothers | 86 preterm infants, 86 full-term infants | Depression, psychological distress, anxiety | Of those screening positive for anxiety, 75% were mothers of pre-term babies. Of those screening positive for comorbid depression and anxiety, 83.7% were mothers of pre-term babies. |

**Table 2: Tools Used to Assess Anxiety In The Included Studies**

| Tool Used | Author and Year of Publication |
|---|---|
| Brief Symptom Inventory | [Baptista, 2018] |
| State-Trait Anxiety Inventory | [Cajiao-Nieto, 2021] [Harris, 2018] |
| Parent Stressor Scale: Neonatal Intensive Care Unit | [Cajiao-Nieto, 2021] [Gerstein, 2019] [Harris, 2018] [Al Maghaireh, 2017] |
| Modified Perinatal PTSD Questionnaire | [Harris, 2018] |
| Kessler Psychological Distress Scale | [Mutua, 2020] |

## 4. Discussion

According to the World Health Organization (WHO), the definition of preterm birth is the birth of babies at less than 37 completed weeks of pregnancy. This is then further categorized into extremely preterm (<28 weeks), very preterm (28-32 weeks), and moderate to late preterm (32 to 37 weeks). The annual global estimate for premature babies is 15 million and is increasing [World

Health Organization, 2018]. The American Psychological Association reports anxiety to be an emotion that includes feelings of tension and worrying thoughts and may manifest as changes in vital signs ["Anxiety," 2022]. The studies included in this review have linked parental anxiety with the birth of and caring for a premature infant. Different tools have been used in the studies to assess anxiety, as indicated in *Table 2*.

Through our analysis of the published literature, it was possible to find several articles which can give us greater insight into the relationship between an infant born premature and how this affects the parent's mental status, particularly their anxiety levels. Several themes emerged during our analysis, with the most consistent themes being amongst the mothers of premature infants, with fewer studies focusing on the mental health of the fathers. These themes are explored below.

### *4.1 Mothers of preterm infants, compared to mothers of term infants*

The studies by Harris et al. and Mutua et al. showed to varying degrees that there is an association between prematurity and parental anxiety/associated mood symptoms [Harris, 2018] [Mutua, 2020]. The association was demonstrated by Mutua et al. (2020), who showed that 35.1% of all the mothers presented with symptoms of anxiety. Of these women, 75% were mothers of preterm infants. Their research goes further to show the discordance with the comorbid presentation of depression and anxiety, where 25% of the woman were affected by both conditions, but of these, the majority (83.7%) were mothers of preterm infants [Mutua, 2020]. An association was seen by Harris et al. (2018) to a lesser degree. Harris et al. showed that 64% of all the mothers who took part in the study demonstrated psychological distress, including concerns of increased stress, depression, anxiety, and symptoms of post-traumatic stress [Harris, 2018]. However, the association between mothers of preterm infants and these symptoms was high at 70%, whereas in those mothers with term infants, the incidence was lower at 60% [Harris, 2018]. Harris et al. were also able to demonstrate that lower infant birth weights correlated with lower levels of psychological well-being [Harris, 2018]. Fernández Medina et al. established, through a qualitative basis, the association the participants discussed how they felt seeing their premature babies in the NICU brought positive feelings of joy and excitement, but there were also negative feelings of anxiety and fear [Fernández Medina, 2018]. Interventions such as massaging the baby increased the bond between the mother and baby and resulted in reduced stress and anxiety. The participants stated that the most effective emotional support which helped them reduce anxiety was the support of other mothers of preterm infants [Fernández Medina, 2018].

These three studies were designed with pre-determined inclusion and exclusion criteria and research questions. Harris et al. [Harris, 2018] and Mutua et al. [Mutua, 2020] enrolled both a study group consisting of a mother and preterm baby dyads and a control group of mother and term baby dyads. The study by Fernández Medina et al. [Fernández Medina, 2018] lacked a control group. Harris et al. [Harris, 2018] and Mutua et al. [Mutua, 2020] executed their research using standardized and structured questionnaires. Fernández Medina et al. [Fernández Medina, 2018], however, utilized a focus group and semi-structured interviews.

Each study possessed its limitations, including small sample size, with Fernández Medina et al. [Fernández Medina, 2018] only having 16 mothers involved, while Harris et al. [Harris, 2018] had 84 mothers, and Mutua et al. [Mutua, 2020] were the most satisfactory with 172 mothers involved. All studies were limited by their observational nature. Harris et al. [Harris 2018] noted that other limitations included a disproportionally high level of lower socioeconomic parents and the loss of enrolled participants. Mutua et al. [Mutua, 2020] noted delays in data collection, non-generalizability to the wider population, and limitations of self-reporting. Fernández Medina's [Fernández Medina, 2018] study was limited to its qualitative nature, lack of other minorities, and that the infants were housed in a physical space that was shared with children up to 14 years of age. Harris et al. suggested that these findings may be attributed to more stressors in relation to the critical status of the baby, a longer hospital stay, and feelings of inability to protect the baby [Harris, 2018].

The studies included in this review were similar to those in published literature, such as Gondwe et al., which evaluated mothers of early preterm, late preterm, and full-term babies and found that the mothers of early-preterm infants experienced the most emotional distress, followed by the mothers of late-preterm infants, then mothers of full-term infants [Gondwe, 2020].

Gondwe et al. and Harris et al. suggested routine screening and treatment for the mother [Harris, 2018] [Gondwe, 2020]. Harris et al. also suggested encouraging parents' participation in the NICU and unrestricted access to the infant in the postnatal period [Harris, 2018].

### *4.2 Mothers of preterm infants at NICU discharge, versus at 5 years postnatal age*

Gerstein et al. evaluated mothers of babies born ≤30 weeks gestational age [Gerstein, 2019]. These mothers were evaluated through questionnaires when the babies were discharged from the NICU. The children returned when they were 5 years old, and both the children and the mothers were reevaluated [Gerstein, 2019]. The assessment tool for the mothers included the PSS: NICU (Parental Stressor Scale: Neonatal Intensive Unit subscale), which includes correlates for anxiety, among other psychological stressors [Gerstein, 2019]. This study found high levels of depression and stress in the NICU were linked to less sensitivity and

greater negative behaviors of the mothers at the 5-year point in time [Gerstein, 2019]. These findings may have long-term consequences, including difficulty noticing child cues, inappropriate responses, reduced praise, and reduced positive affect shown toward the child. It is suggested to identify mothers who are showing signs of depression and stress and intervene promptly [Gerstein, 2019].

This study was designed with pre-determined inclusion and exclusion criteria and research questions through questionnaires, as well as assessments of the child at 5 years of age and assessment of the mother-child interactions [Gerstein, 2019]. Limitations included a lack of a control group and a small sample size [Gerstein, 2019].

### *4.3 Fathers of preterm infants, compared to fathers of term infants*

Cajiao-Nieto et al. demonstrated that in their study, the fathers of preterm infants had higher amounts of anxiety than when they were compared to fathers of term infants [Cajiao-Nieto, 2021]. This observation was significant when evaluated initially in the first three days postpartum, as well as when they were reevaluated a second time at 15 to 20 days after [Cajiao-Nieto, 2021]. Specific characteristics which resulted in anxiety and depression included the neonate's appearance and behavior [Cajiao-Nieto, 2021]. With respect to socio-economic demographics, significant associations with increased anxiety found in the first evaluation included social support, the number of children, and the family's income, while the positive associations in the second evaluation were the quality of the relationship between the mother and father, and the prenatally detected health risk of the infant [Cajiao-Nieto, 2021].

This study was designed with pre-determined inclusion and exclusion criteria and research questions through semi-structured interviews and questionnaires [Cajiao-Nieto, 2021]. The authors noted limitations to include lack of generalizability, small sample size, limited immigrant involvement, language barriers, and lack of previous knowledge of fathers' mental health status, among others [Cajiao-Nieto, 2021]. They suggested that both categories of fathers would gradually decrease as fathers adjusted to the situation and their new role. The initial insult of having a premature baby admitted to the NICU was a source of anxiety and depression [Cajiao-Nieto, 2021].

The results of Cajiao-Nieto et al. are similar to the results of other studies, such as Petersen et al. showed that in fathers of preterm babies, their levels of anxiety were high during the mother's pregnancy and persisted into the postnatal period, in contrast to the resolution of symptoms in fathers of term babies [Petersen, 2020]. Petersen et al. suggest that persisting anxiety in fathers of preterm babies may be attributed to admission to NICU, delayed discharge, delayed maternal discharge, and isolation [Petersen, 2020]. Petersen et al. and Cajiao-Nieto et al. (2021) suggest that fathers of preterm infants should be screened for symptoms of anxiety and depression, and intervention given where necessary [Cajiao-Nieto, 2021] [Petersen, 2020].

### *4.4 Fathers of preterm infants, compared to mothers of preterm infants*

A study by Al Maghaireh et al. of both parents of 37 term and 118 preterm babies demonstrated that mothers were more affected by stress, anxiety, and sleeping difficulties than the fathers of the infants [Al Maghaireh, 2017]. They noted a strong positive association between stress levels and anxiety, as well as depression and sleeping difficulties. The parents noted that a high level of stress was related to the infant's appearance and behavior, but this was again noted to be increased in mothers as compared to the fathers [Al Maghaireh, 2017]. They suggest that mothers' increased state of anxiety may be related to mothers feeling like they were not the primary caregiver for their hospitalized babies [Al Maghaireh, 2017].

This study was designed with pre-determined inclusion and exclusion criteria and research questions through self-administered questionnaires. The authors noted that their approach of convenience sampling may have affected the generalizability of the study and possibly increased bias [Al Maghaireh, 2017].

This study by Al Maghaireh et al. is comparable to those found in the literature, such as Alexopoulou et al., which demonstrated that mothers of preterm infants exhibited more symptoms of anxiety and depression than the fathers [Alexopoulou, 2018]. They stated that the parents' state of anxiety was linked to how well they were informed about their baby's condition [Alexopoulou, 2018]. In the future, the management of premature babies should be a more family-oriented approach [Alexopoulou, 2018], and strategies should be devised to decrease parental stress and encourage their mental wellbeing [Al Maghaireh, 2017].

### *4.5 Mothers of preterm multiple infants, compared to mothers of preterm singleton infants*

Baptista et al. studied mothers whose ex-preterm infants were now one year of age [Baptista, 2018]. According to this study, mothers of preterm multiples were more like to experience stress than their singleton counterparts. They also reported that mothers of preterm multiples, when facing poor socioeconomic circumstances, were likely to experience higher levels of psychological symptoms. These psychological symptoms were assessed using the BSI (brief symptom inventory), which included anxiety [Baptista, 2018].

This study was designed with pre-determined inclusion and exclusion criteria and research questions through self-administered questionnaires. Limitations noted included the small sample size and those regarding the explorations of elements related to time which could not be addressed due to the cross-sectional nature of the study. They suggested the implementation of treatments designed to target and assist in the psychological well-being of parents of preterm multiples [Baptista, 2018]. Gondwe et al. also found that mothers of preterm multiple infants experienced greater anxiety at discharge, as well as other psychological symptoms such as depression ad posttraumatic stress, which were greater than when compared to mothers of preterm singletons [Gondwe, 2020].

### *4.6 Limitations of this Review*

Limitations of this systematic review include all the included papers being observational studies, exclusion of studies that were not in the English language, articles that were beyond 5 years of publishing, articles that were not in the databases searched, and articles that were unpublished, not peer-reviewed, or gray literature.

## 5. Conclusions

Prematurity can be related to parental anxiety. This review aimed to analyze the relationship between premature birth, and parental anxiety, focusing on the emotional status of both parents. Our analysis showed that mothers of preterm infants had greater symptoms of anxiety, comorbid anxiety, and depression and showed long-term consequences of stress and anxiety. Mothers of preterm multiples were more likely to experience stress and anxiety than mothers of preterm singletons. Fathers of preterm infants experienced higher levels of stress than fathers of term infants, but fathers of preterm infants experienced less stress than mothers of preterm infants. These findings suggest that routine mental health screening and intervention should be undertaken for both mothers and fathers of preterm infants.

**Funding:** This research received no external funding.
**Conflicts of Interest:** The authors declare no conflict of interest.
**Publisher's Note**: All claims expressed in this article are solely those of the authors and do not necessarily represent those of their affiliated organizations or those of the publisher, the editors, and the reviewers.
**Ethical approval:** Due to the nature of the research, ethical approval was not required.
**Informed consent:** Due to the nature of the research, Informed consent was not required.
**ORCID ID:** Travis Satnarine ORCiD: 0000-0001-9320-1570
**Publisher's Note**: All claims expressed in this article are solely those of the authors and do not necessarily represent those of their affiliated organizations, or those of the publisher, the editors and the reviewers.

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