

# Pregnant women's perception of the emotional impacts of the COVID-19 pandemic in light of the Roy Adaptation Model self-concept mode

Percepção de gestantes sobre os impactos emocionais da pandemia de COVID-19 à luz do modo autoconceito da Teoria da Adaptação

La percepción de las mujeres embarazadas sobre los impactos emocionales de la pandemia de COVID-19 a la luz del modo de autoconcepto del Modelo de Adaptación de Callista Roy

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### **ABSTRACT**

**Objective:** to analyze pregnant women's perception of the emotional impacts during the COVID-19 pandemic in light of the Roy Adaptation Model selfconcept mode. Methods: descriptive research with a qualitative approach, based on Callista Roy's Adaptation Model, focusing on self-concept. Data collection took place in a Basic Health Unit in a city in the countryside of Ceará, from August to September 2022, with ten pregnant women, through semi-structured interviews, consisting of questions about sociodemographic data and emotional aspects related to the gestational period during the COVID-19 pandemic. The data were subjected to the content analysis technique. Results: four thematic categories emerged: Self-awareness of pregnant women regarding the emotional aspects experienced during the COVID-19 pandemic; Self-ideal of pregnant women during the pandemic; Conceptions of pregnant women regarding family support; and pregnant women's understanding regarding mental healthcare during pregnancy. Conclusion: During the COVID-19 pandemic, pregnant women's adaptive processes were mobilized, involving the self-concept mode, in the "personal self" dimension, which includes self-awareness of fear, threats to the baby's self-ideal health, support network appreciation, and unmet expectations of the mental health approach in prenatal care.

Descriptors: COVID-19; Nursing; Pregnant Women; Perception; Mental Health.

### **RESUMO**

Objetivo: analisar a percepção das gestantes sobre os impactos emocionais ocorridos durante a pandemia de COVID-19, à luz do modo autoconceito da Teoria da Adaptação. Métodos: pesquisa descritiva com abordagem qualitativa, baseada na Teoria da Adaptação de Callista Roy com foco no modo autoconceito. A coleta de dados ocorreu em uma Unidade Básica de Saúde de um município do interior cearense, de agosto a setembro de 2022, com 10 gestantes, por meio de entrevista semiestruturada, composta de perguntas sobre os dados sociodemográficos e os aspectos emocionais relacionados ao período gestacional durante a pandemia de COVID-19. Os dados foram submetidos à técnica de Análise de Conteúdo. Resultados: emergiram quatro categorias temáticas: autoconsciência das gestantes frente aos aspectos emocionais vivenciados durante a pandemia de COVID-19; autoideal das gestantes diante do contexto pandêmico; concepções das gestantes acerca do suporte familiar; e compreensão das gestantes quanto à assistência à saúde mental na gestação. Conclusão: Durante a pandemia de

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COVID-19, foram mobilizados processos adaptativos das gestantes, envolvendo o modo autoconceito, na dimensão do "eu pessoal", que inclui a autoconsciência do medo, ameaças ao autoideal de saúde do bebê, valorização da rede de apoio e expectativas não atendidas da abordagem da saúde mental no atendimento pré-natal.

Descritores: COVID-19; Enfermagem; Gestantes; Percepção; Saúde Mental.

#### RESUMEN

Objetivo: analizar la percepción de las mujeres embarazadas sobre los impactos emocionales durante la pandemia COVID-19 a la luz del modo de autoconcepto del Modelo de Adaptación de Callista Roy. Métodos: investigación descriptiva con enfoque cualitativo, basada en el Modelo de Adaptación de Callista Roy, centrándose en el modo de autoconcepto. La recolección de datos se realizó en una Unidad Básica de Salud de una ciudad del interior de Ceará, de agosto a septiembre de 2022, con diez mujeres embarazadas, a través de una entrevista semiestructurada, compuesta por preguntas sobre datos sociodemográficos y aspectos emocionales relacionados al período gestacional. durante la pandemia de COVID-19. Los datos fueron sometidos a la técnica de análisis de contenido. Resultados: surgieron cuatro categorías temáticas: Autoconciencia de las mujeres embarazadas sobre los aspectos emocionales vividos durante la pandemia de COVID-19; Autoideal de las gestantes en el contexto de pandemia; Concepciones de las mujeres embarazadas sobre el apoyo familiar; y Comprensión de las mujeres embarazadas sobre la atención de la salud mental durante el embarazo. Conclusión: Durante la pandemia de COVID-19, se movilizaron los procesos adaptativos de las mujeres embarazadas, involucrando el modo de autoconcepto, en la dimensión del "yo personal", que incluyen la autoconciencia del miedo, las amenazas a la salud ideal del bebé, la apreciación de la red de apoyo y las expectativas insatisfechas del enfoque de salud mental en la atención prenatal.

Descriptores: COVID-19; Enfermería; Mujeres Embarazadas; Percepción; Salud Mental.

### INTRODUCTION

Motherhood represents a milestone of profound transformations in women's lives, encompassing biological, psychological, and behavioral aspects. From the moment pregnancy is confirmed, women undergo adaptation and acceptance, changes in body image, and maternal bond development with their babies. Moreover, they deal with social challenges, such as marital, family, social relationships, work, and daily household activities<sup>(1)</sup>. Given the complexity of this situation, it is necessary to consider the uniqueness of each pregnant woman so that the pregnancy experience happens healthily.

Due to these necessary adaptations, hormonal changes, and social changes, this period can also generate anxiety, increasing vulnerability to psychological problems and mental disorders. Therefore, pregnant women must receive emotional support and psychosocial care during prenatal care to mitigate these impacts<sup>(2-4)</sup>. Promoting pregnant women's mental health benefits both women and the fetus' physical, emotional, and psychological development<sup>(3,4)</sup>.

With the emergence of the new coronavirus, SARS-CoV-2, the etiological agent of COVID-19, from the end of 2019, pregnant women became predisposed to infection due to physiological changes and were considered a risk group, requiring specialized care with priority assistance, to overcome the challenges present in this context<sup>(5)</sup>.

Conditions such as intense stress, emergencies, and natural disasters increase the risk of perinatal morbidity related to negative impacts on pregnant women's mental health. In the face of the COVID-19 pandemic, pregnant women were particularly vulnerable to psychological problems, influenced by concerns about newborns' safety and well-being and the adaptations needed to protect themselves against the virus, with physical distancing, home isolation, remote appointments, and fear of not receiving the expected care and support during prenatal, childbirth and postpartum care<sup>(6)</sup>.

Stressful events associated with the pandemic have aggravated the emotional repercussions inherent to the gestational period, causing greater psychological distress in this population. During the pandemic, pregnant women have been at greater risk of developing depression, anxiety, post-traumatic stress disorder, and suicide<sup>(7)</sup>.

A study conducted in Canada with 1,987 pregnant women during the pandemic found an increase in anxiety (57%) and depression (37%) symptoms compared to data obtained during the pre-pandemic period<sup>(8)</sup>. In Brazil, research using the State-Trait Anxiety Inventory (STAI) with 100 pregnant women found a prevalence of 36% of high state anxiety in the third trimester of pregnancy during the COVID-19 period<sup>(9)</sup>.

Changes in pregnant women's mental status have been associated with premature birth and cognitive problems in childhood. Therefore, healthcare professionals must investigate pregnant women's mental status and develop strategies that help in the recovery of their mental health, to avoid negative maternal-fetal outcomes in the short and long term<sup>(10)</sup>.

Considering that one of the goals of nursing is to promote the adaptation of individuals in the four modes of adaptation, namely physical-physiological, self-concept, interdependence, and role function<sup>(11)</sup>, and taking into account pregnant women's psycho-emotional demands imposed by the pregnancy process, added to the context of facing the COVID-19 pandemic, it is essential to understand the adaptive process developed by pregnant women in this context, especially concerning the self-concept mode.

In Callista Roy's Adaptation Model<sup>(11)</sup>, the self-concept mode is related to individuals' psychological and spiritual aspects, being divided into two facets. The first refers to the "physical self" inherent in individuals' perception of their physical characteristics. The second, called "personal self", is based on three aspects: self-awareness, which is individuals' resistance to avoid psychic imbalance; self-ideal, which is related to the expectation that a person has about themselves and the world; and spiritual-ethical-moral, which concerns personal beliefs and values<sup>(11)</sup>.

The information obtained in this study can be used as a theoretical and practical basis to promote qualified nursing care for pregnant women's emotional aspects in general and in the context of new health crises.

In this regard, we aimed to analyze pregnant women's perception of the emotional impacts during the COVID-19 pandemic in light of the Roy Adaptation Model self-concept mode.

### **METHODS**

This is descriptive research with a qualitative approach, which used Callista Roy's Adaptation Model as a framework, with emphasis on self-concept mode, relating to individuals' psychological aspects<sup>(11)</sup>.

To ensure the study's methodological rigor, we followed the COnsolidated criteria for REporting Qualitative research (COREQ) checklist recommendations<sup>(12)</sup>.

The research was conducted in a Basic Health Unit (BHU) located in the urban area of a city in the countryside of the state of Ceará. This BHU was chosen because it was a context in which the field researcher was involved in the care of pregnant women and assisted in prenatal appointments and practical activities developed as an undergraduate nursing course professor.

The recruitment of pregnant women took place in the BHU waiting room for prenatal care appointments. Pregnant women attending prenatal appointments at the aforementioned BHU and aged 18 or over were included. Pregnant women presenting unfavorable clinical conditions, such as complications in the immediate postpartum period and/or conditions of emotional fragility after childbirth that prevented their participation in the interview, were excluded. None of the pregnant women recruited met this criterion. Therefore, ten pregnant women who met the inclusion criteria participated in the study.

Data collection took place from August to September 2022, through semi-structured interviews, which consisted of closed-ended questions aimed at obtaining sociodemographic data and open-ended questions aimed at pregnant women's perceptions of emotional aspects related to the gestational period during the CO-VID-19 pandemic.

The variables addressed in closed-ended questions included sociodemographic data and included age, level of education, marital status, occupation, income, place of residence, and pregnancy planning.

Open-ended questions were conducted to identify what it was like for pregnant women to experience pregnancy during the COVID-19 pandemic; what feelings were experienced during this period; the impact of pregnancy during the pandemic on pregnant women's mental health; support network concerning listening and emotional support during pregnancy; addressing issues related to mental health during pregnancy during prenatal care appointments and/or assistance focused on emotional aspects.

Data collection instrument pre-testing was carried out to identify and eliminate possible flaws<sup>(13)</sup>. Pre-testing was carried out one week before the final collection and included the participation of five pregnant women treated at the BHU selected for the study, who contributed to the instrument by suggesting a change in the approach related to the term "mental health" to "emotional aspects", with the necessary adjustments being made. These pregnant women were not included in the study population.

The interviews lasted an average of 20 minutes and were recorded on an electronic device such as a smartphone, in an individual appointment room, providing privacy and ensuring the quality of the recording.

Data collection was completed using the theoretical saturation criterion when representative information of the context investigated was obtained, and it was not necessary to continue the interviews<sup>(14)</sup>.

To ensure quality in the interview process, one of the researchers, a nursing student in the final semester of the course, was trained by a senior researcher. The interviews were transcribed in full by the same researcher who conducted the interviews. Data validation was not performed by participants later, due to the expected return interval for appointments of approximately 30 days and the same period for returning the material. To ensure statement content reliability, the transcripts of interviews were read simultaneously with the audio recordings being listened to, to check the information collected.

The interviews took place after pregnant women signed the Informed Consent Form, in two copies, one copy remaining with the researcher and the other with the interviewee. Interviewee anonymity was guaranteed by using codes containing letters and numbers (G1, G2, G3, and so on).

The data were subjected to the content analysis technique and consisted of three stages: pre-analysis; material exploration; and treatment of results and interpretation<sup>(15)</sup>. The analytical categories emerged from empirical data and articulation of interview contents with Roy Adaptation Model assumptions, focusing on "personal self" aspects of the self-concept adaptive mode.

Standards of Resolution 466/2012 of the Brazilian National Health Council, which provides guidelines and regulatory standards for research involving human beings, were met<sup>(16)</sup>. The study was approved by the *Universidade Regional do Cariri* Research Ethics Committee in August 2022, under Certificate of Presentation for Ethical Consideration (In Portuguese, *Certificado de Apresentação de Apreciação Ética* - CAAE) number 60814222.0.0000.5055.

### **RESULTS**

The age of the ten pregnant women interviewed ranged from 18 to 39 years. Regarding education, all were educated, with a predominance of complete high school (n=8). As for marital status, six pregnant women were single. Concerning place of residence, all lived in urban areas (100%). The majority were unemployed (n=7). Regarding pregnancy planning, six pregnant women responded that pregnancy was not planned.

Based on the analysis of the statements obtained in the interviews, in light of the theoretical framework related to the "personal self" of the self-concept adaptive mode of the Roy Adaptation Model, the following categories were defined: Self-awareness of pregnant women regarding the emotional aspects experienced during the COVID-19 pandemic; Self-ideal of pregnant women during the pandemic; Conceptions of pregnant women regarding family support; and Pregnant women's un-

derstanding regarding mental healthcare during pregnancy.

## Self-awareness of pregnant women regarding the emotional aspects experienced during the COVID-19 pandemic

This category gathered reports of pregnant women regarding their perception of emotional impacts resulting from the pandemic period related to efforts to change their lifestyle to avoid becoming ill with CO-VID-19.

Most pregnant women reported experiencing emotional changes during pregnancy, highlighting fear as the main feeling experienced, in addition to a lack of knowledge about the disease and its effects, as shown in the following reports:

It's been very difficult because we have to take precautions. Pregnant women must always wear a mask, they can't be in places with a lot of people, and they must always stay away. (G4)

We're afraid, right? Because it's a new disease and the causes and effects are not yet fully known, and each new development generates a certain fear, a certain concern. (G10)

# Self-ideal of pregnant women during the pandemic

In this category, we sought to present pregnant women's adaptive behaviors regarding self-ideal perspectives in the face of uncertainties arising from the CO-VID-19 pandemic period.

There were predominant reports of fear of harm to the baby's health, uncertainty regarding child development, and anxiety about the possibility of complications during pregnancy. Expectations regarding childcare and the provision of resources for their support also had a negative impact on the emotional aspect. However, only one pregnant woman reported seeking support from a psychologist:

From the very beginning, when we find out we are pregnant, that's when we start to feel this fear, this worry that the baby won't be perfect. Faced with so many situations, I even asked a psychologist for help [...]. (G2)

At first, a lot of fear. I've always been very anxious, especially in this sense, fear of how the child might come, fear of how pregnancy will be, fear of the period, of complications. (G10)

It's a bit complicated, right? Because of the thought that the child might be born with something. (G5)

I felt fear, anxiety, sadness, for fear of not being able to give my daughter a good pregnancy. (G4)

I worry a lot. I worry about anything. Currently, my biggest concern is about the baby's things, because in these conditions we already pay rent [...]. (G5)

# Conceptions of pregnant women regarding family support

This category addressed pregnant women's self-assessment regarding the need for family support during pregnancy and the understanding of the "spiritual-ethical-moral" self-concept, which concerns personal beliefs and values. Most pregnant women highlighted the importance of a support network and family support during pregnancy.

They also reported that they received emotional support from family members and that they were followed up during appointments. However, one of the pregnant women stated that she did not share her emotional problems with her family for fear of judgment, as shown in the following statements:

During pregnancy, it's great to have support. If your family is against it, you'll be shaken by not having anyone on your side, but my family accepted me well and so you know that there will be a place there, that they will help you all the time. (G8)

I became much closer to my family during this period. (G3)

My family is always active, they are always present at my appointments, they are always by my side. (G4)

Because they are always supporting me, I feel calmer, happier, I already have two other daughters. (G1)

I did feel fear. Sometimes, out of fear, I don't even talk, I keep it to myself, I don't tell almost anyone, and I also see who I can talk to who won't judge me. (G9)

# Pregnant women's understanding of mental healthcare during pregnancy

This category listed pregnant women's understanding of mental healthcare during the gestational period, seeking to identify how their self-concept was concerning "spiritual-ethical-moral".

When asked about how they understood mental healthcare during prenatal care, nine pregnant women said they had never received this type of care. However, all said they were interested in receiving care that addressed psychological demands, because they recognized the importance of care focused on emotional aspects during pregnancy, as presented below:

No, it's the first time they've talked about mental health. They talk more about pregnancy. (G6)

I think it's important to talk about it (mental health-care). I missed having that. (G7)

I believe it was important to bring in assistance programs, lectures, guidance [...], I believe we really need this assistance, lectures, books, information that help us to become stronger. (G10)

Even if we are not pregnant, everyone needs support regarding mental health, and sometimes we feel a little apprehensive, right? Sometimes it makes us anxious, so we always need it. (G1)

### DISCUSSION

During the COVID-19 pandemic, the self-concept mode was mobilized, notably, from the perspective of "personal self", leaving "physical self" in the background. In the self-awareness dimension, the feeling of fear, fear for one's own life, was revealed. The self-ideal dimension involved health and care for the baby and one's own sustenance, perceived as threatened by the COVID-19 pandemic. In the "spiritual-ethical-moral" dimension, concerning pregnant women's values and beliefs, it was verified the importance attributed to the support network and family support during pregnancy and that the lack of seeking this support may be due to fear of judgment. Also in this dimension, pregnant women's perception was that prenatal care did not address their mental health and that this possibility was an expectation of theirs, given the psycho-emotional conditions experienced.

Considering human beings as biopsychosocial individuals, it is necessary for them to interact with the environment around them, which includes a series of internal and external stimuli, whether circumstances, conditions, or influences, at a given time, which encourage adaptive responses, which can be positive or negative.

No person is free from situations that require an adaptive process, as inevitable events such as death, ill-

ness, or stress are part of human existence; however, the ability to deal with these situations must be improved to best cope with the condition experienced<sup>(17)</sup>.

During the COVID-19 pandemic, pregnant women had to deal with uncertainty regarding questions about the possibility of transmission of the disease from mother to child, as well as about the effects of the disease on the fetus, associated with fear of gestational complications, as they were classified in the risk group and insecurity about the available treatments and effectiveness of vaccines. This resulted in negative impacts on their mental health during this period<sup>(18)</sup>.

They needed to react and face changes in the environment, to seek the best level of emotional adaptation necessary to deal with the health crisis that was emerging, through the development of coping mechanisms<sup>(17)</sup>.

In light of the analysis of pregnant women's perceptions of the emotional impacts of COVID-19 in light of the self-concept inherent in the Roy Adaptation Model, the results of this study reveal pregnant women's self-awareness regarding aspects experienced, the self-ideal in the context of resulting uncertainties, the concepts about family support and the recognition of the need for mental healthcare during pregnancy.

According to Roy Adaptation Model<sup>(11)</sup>, the self-concept mode is related to individuals' psychological and spiritual aspects, i.e., issues related to the human psyche. This mode is associated with the "physical self" and "personal self". In pregnant women's statements, the perspective centered on the adaptive mode related to the "personal self" aspect was predominant, which is based on "self-awareness", which consists of individuals' resistance and efforts to avoid emotional imbalance, on "self-ideal", which is related to what people expect from themselves and the world, and on "spiritual-ethical-moral", which is based on individual beliefs and values<sup>(11)</sup>.

Positive adaptation promotion in self-concept mode, considering individuals' spiritual and psychological aspects, involving values, beliefs, and feelings of each being, must be encouraged, with a view to their psychological integrity, fundamental to their health<sup>(11)</sup>.

When people experience problems that affect their well-being, such as suffering from an illness, the process of adaptation in terms of self-concept can occur through spiritual strengthening, such as belief and faith in the recovery of one's health, and, according to Roy Adaptation Model, these ideas should be encouraged as a way of coping<sup>(17)</sup>.

Regarding pregnant women's self-awareness regarding the emotional aspects experienced during the CO-VID-19 pandemic, this study highlighted the emotional

overload that the pregnancy cycle itself caused in women, which increased during this period of dissemination of an unknown virus. This aspect was linked to the exceptional protective measures against the virus, which caused emotional impacts on the private and professional lives of pregnant women, such as stress, fear, anxiety, and depression<sup>(19)</sup>.

The changes imposed by the new coronavirus in the face of social isolation and other preventive measures have reinforced the importance of pregnant women being heard and welcomed. It is essential to reflect on the feelings inherent to the pregnancy period during a pandemic, as this can be experienced in different ways by each woman<sup>(20)</sup>.

The COVID-19 pandemic has also added challenging circumstances for the mental health of pregnant women given the need for adaptations in healthcare, such as changes in the routine of prenatal appointments, as well as restrictions on the presence of companions in maternity wards at the time of birth, factors that contributed to the increase in psychological suffering of these women<sup>(21)</sup>.

Furthermore, it was identified that the self-ideal of pregnant women in the face of the pandemic context was also associated with significant emotional fluctuations during pregnancy, mainly due to uncertainty regarding children's development and fear of possible complications, due to pregnant women's understanding of their risk condition for COVID-19 illness, demonstrating the impact of the pandemic on pregnant women's expectations regarding themselves and their children's health.

Given this demand, the need for specialized assistance to promote maternal and fetal well-being stands out. This approach should be guided by the perspective of avoiding harm to the mental health of pregnant women during prenatal care, which can be carried out through educational activities focused on the psychosocial aspects inherent to the gestational period<sup>(22)</sup>.

Nursing care is needed that focuses not only on biological risks but also on the emotional vulnerability of pregnant women during the pandemic period<sup>(23)</sup>.

According to Roy Adaptation Model<sup>11</sup>, nursing aims to improve life processes to promote adaptation in terms of a person's thoughts and feelings when facing changes. Nursing care must be guided by the recognition of possible adversities that may occur in the process of adapting to the gestational period and the influence of these changes on the subjective aspects of pregnant women.

As for pregnant women's conceptions about family support during pregnancy, most had family support, and some had support from their partners, which made

them feel welcomed. It is understood that the gestational period is a time of intense emotional experience and that it can be surrounded by contradictory feelings, anxiety, and doubts, causing pregnant women to need time to be used to this new stage in their lives, which requires a subjective reorganization, therefore, the family support network becomes essential in this context<sup>(24)</sup>.

It is important to note that most of the participants in this study were single, and this may have contributed to some not sharing their feelings with their families for fear of judgment. Therefore, based on the results of this study, it is possible to emphasize the importance of a support network and family support during the gestational period, since this lack, identified in the speeches of some pregnant women, caused emotional harm to them.

Regarding care directed at the mental health of pregnant women in this study, the speeches presented highlighted the importance of healthcare professionals taking responsibility for the quality of assistance focused on psycho-emotional aspects, as they are more emotionally vulnerable in the face of the various changes and adaptations inherent to pregnancy<sup>(4)</sup>.

A multicenter study conducted in Brazil found that interventions aimed at reducing stress and promoting increased self-confidence regarding protective measures helped to alleviate general levels of stress and anxiety in pregnant women during the pandemic, combined with effective communication and psychological support<sup>(24)</sup>.

There is a need to understand the factors associated with the emotional aspects of pregnancy and their impact on the adaptive process, especially when it occurs in a pandemic context<sup>(25)</sup>.

Understanding these aspects reinforces the importance of applying the Roy Adaptation Model to qualify the care provided by nurses, helping to establish strategies that facilitate the development of adaptive modes<sup>(26)</sup>. The investigation of pregnant women's emotional aspects by teams working in Primary Health Care is essential for the proper reception of the psychological issues that they experience<sup>(3)</sup>.

Although the present study has the limitation of having been developed in a single BHU, it makes it possible to understand pregnant women's adaptation in terms of self-concept and to reflect on behaviors aimed at pregnant women's emotional aspects during prenatal care.

Understanding Roy Adaptation Model within the self-concept aspect may contribute to directing interventions aimed at promoting pregnant women's emotional health, aiming to guarantee psychological support when facing a pandemic context, to promote a better adaptive response.

Because of this, it is suggested that the results and concepts presented in this study be used as theoretical support to guide qualified nursing care for the emotional aspects of pregnant women during prenatal care.

### CONCLUSION

Based on Roy Adaptation Model, it is observed that, during the COVID-19 pandemic, pregnant women's self-concept mode was mobilized, notably "personal self", by the need for adaptation of psychosocial origin, self-awareness of factors that are harmful to their emotional well-being and threats to self-ideal.

Single, unemployed pregnant women who did not plan their pregnancy and were not approached about mental health during prenatal care, in BHUs, during the COVID-19 pandemic, reveal their perceptions about the emotional impacts experienced during the pandemic context, marked by fear and uncertainty regarding the baby's health, their ability to provide the necessary care for the baby and achieve self-sustainability conditions. They recognize the need for a support network to promote adaptation to pregnancy contribute to mental balance and reinforce the need for assistance focused on mental health during pregnancy.

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### Conflict of Interests

None.

#### Authors' contributions - CRediT

**TBB:** conceptualization; data curation; formal analysis; investigation; methodology; project administration; resources; visualization; writing – original draft and writing – review & editing.

**EAR:** conceptualization; data curation; formal analysis; investigation; methodology; project administration; resources; visualization; writing – original draft and writing – review & editing.

**AAGP:** conceptualization; data curation; formal analysis; methodology; resources; visualization; writing – original draft and writing – review & editing.

**RSBLCC:** resources; supervision; validation; visualization; writing – original draft and writing – review & editing.

**LRLS:** resources; supervision; validation; visualization; writing – original draft and writing – review & editing. **EGRC:** methodology; resources; supervision; validation; visualization; writing – original draft and writing – review & editing.

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