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The role of uncertainty in prenatal diagnosis: psychological implications of inconclusive or probabilistic results

Abstract

Background: Advances in prenatal diagnostic technology have paradoxically increased rather than eliminated uncertainty for expectant parents. While screening and diagnostic tests have become more sophisticated, they frequently yield probabilistic or inconclusive results that create complex psychological challenges.

Objective: This review examines the psychological implications of uncertainty in prenatal diagnosis, exploring how probabilistic and inconclusive results affect expectant parents' mental health, decision-making, and pregnancy experience.

Methods: A comprehensive review of literature from medical, psychological, and interdisciplinary sources examining uncertainty in prenatal diagnosis and its psychological consequences.

Results: Uncertainty in prenatal diagnosis manifests in multiple forms, from screening test probabilities to variants of uncertain significance in genetic testing. Psychological impacts include elevated anxiety and depression, impaired prenatal bonding, decision-making paralysis, and long-term effects on mental health and parenting. Individual factors such as tolerance for ambiguity, social support, and healthcare communication significantly influence psychological responses.

Conclusions: Uncertainty is an inherent aspect of modern prenatal care that requires targeted psychological support. Healthcare systems must develop comprehensive approaches that address both medical and psychological aspects of uncertain diagnoses to optimize outcomes for families.

Keywords: prenatal diagnosis, uncertainty, psychological impact, genetic counselling, decision-making, anxiety, prenatal bonding

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Introduction

The landscape of prenatal diagnosis has undergone a dramatic transformation over the past several decades, with technological advances offering increasingly detailed insights into foetal development and potential abnormalities. Non-invasive prenatal testing (NIPT), high-resolution ultrasound, chromosomal microarrays and whole exome sequencing have expanded diagnostic capabilities. However, with these advances comes an unexpected consequence: rather than providing certainty, modern prenatal testing often generates complex probabilistic information that leaves expectant parents navigating unprecedented levels of uncertainty.

The traditional concepts of "normal" vs "abnormal" have been replaced by risk percentages, variants of uncertain significance, and conditional probabilities that challenge both healthcare providers and parents. A screening test result of "1 in 250 risks for Down syndrome" or a genetic finding labelled as a "variant of uncertain significance (VUS)" exemplifies the uncertainty that characterizes contemporary prenatal care.

This uncertainty results in a highly emotionally charged context where decisions may have profound implications for the pregnancy, the family, and the future child. Unlike other medical contexts, prenatal diagnostic uncertainty occurs during a limited time window where decisions about the continuation of pregnancy must be made, sometimes in place of incomplete information and under significant pressure.

The psychological implications of this uncertainty are receiving increasing attention as healthcare providers recognize that technological advancement alone cannot address the complex emotional and psychological needs of expectant parents facing ambiguous results. Understanding how uncertainty affects psychological well-being, decision-making processes and long-term family functioning has become essential for providing comprehensive prenatal care.

This review examines the multifaceted nature of uncertainty in prenatal diagnosis and its profound psychological implications for expectant parents, exploring the mechanisms through which uncertainty affects mental health, relationships, and pregnancy experiences, while identifying strategies for supporting families through these challenging circumstances.

Material and methods

A comprehensive literature search was conducted to review the psychological implications of uncertainty in prenatal diagnosis. The search targeted scholarly articles, reviews, and interdisciplinary studies relevant to medical, psychological, and counselling aspects of uncertain or probabilistic prenatal diagnostic outcomes. PubMed and Google Scholar were primarily used to identify articles published up to 2025 using keywords and MeSH terms with a combination of "prenatal diagnosis", "uncertainty", "psychological impact", "anxiety", "genetic counselling", "prenatal bonding", "decision making" and related phrases. The Google search engine was used to identify grey literature, clinical guidelines, and organizational reports

addressing communication strategies and psychosocial interventions in prenatal care.

Selection criteria emphasized studies addressing the psychological, emotional, and decision-making consequences of uncertain or inconclusive prenatal diagnostic results. Studies including various diagnostic modalities such as non-invasive prenatal testing, chromosomal microarray analysis, ultrasound soft markers, and foetal structural anomaly assessment were included. Both qualitative and quantitative research were considered to capture diverse perspectives.

Types of uncertainty in prenatal diagnosis

There are four primary type of uncertainties (Figure 1):

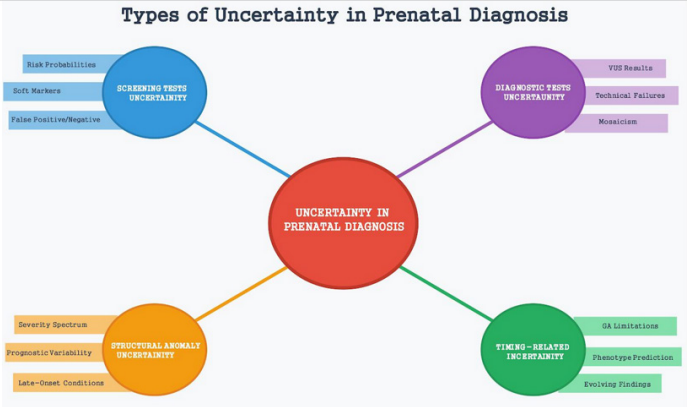

Figure 1 Types of uncertainty in prenatal diagnosis.

Screening Test Uncertainties: Prenatal screening represents perhaps the most common source of uncertainty in modern obstetric care. First and second-trimester screening tests provide risk estimates rather than definitive diagnoses, typically expressed as ratios such as 1:41 or 2:1,000 for conditions like Down syndrome[1] or neural tube defects[2] respectively. These results with probabilities require parents to interpret the complex statistical information while making decisions about further testing or pregnancy management.

The interpretation of screening results is further complicated by the concept of "screen positive" and "screen negative" cutoffs, which are often misunderstood by patients as definitive indicators rather than statistical thresholds.[3] A result slightly above the cutoff threshold may be interpreted dramatically differently than one slightly below, despite a minimal actual difference in risk level.

Ultrasound screening presents additional uncertainty through the identification of "soft markers", findings that are associated with increased risk for chromosomal abnormalities but are often present in normal foetuses.[4,5] The presence of echogenic bowel, choroid plexus cysts, or shortened femur length creates anxiety while providing limited diagnostic clarity, requiring complex counselling about statistical associations and clinical significance.

Diagnostic Test Limitations: Even diagnostic tests, earlier considered definitive, can yield uncertain results. Chromosomal mosaicism, where some cells contain abnormal chromosomes while others are normal, creates diagnostic ambiguity about the degree to which a fetus may be affected. The clinical significance of low-level mosaicism detected through amniocentesis or chorionic villus sampling often cannot be predicted with certainty.[6]

The emergence of chromosomal microarray analysis has introduced the concept of VUS into prenatal diagnosis.[6,7] These genetic findings represent deviations from typical genetic patterns but lack sufficient research evidence to determine their clinical significance. Parents may learn that their fetus carries a genetic variant that could potentially cause developmental delays, autism, or other conditions, but with no ability to predict severity or even certainty of occurrence, putting them in a difficult position.

Technical failures represent another form of uncertainty, occurring when samples are inadequate for analysis or when testing procedures yield inconclusive results.[8] These situations require parents to navigate decisions about repeat testing, alternative diagnostic approaches, or proceeding without definitive information.

Structural Anomaly Uncertainties: Structural abnormalities detected through ultrasound often involve uncertainty regarding severity, prognosis and long-term implications. Conditions such as congenital heart defects, neural tube defects, or limb abnormalities may vary dramatically in their functional impact, from mild cosmetic concerns to life-threatening conditions requiring extensive medical intervention.[9]

The timing of anomaly detection creates additional uncertainty, as some conditions may not be apparent until later in pregnancy or may evolve throughout gestation. Serial monitoring may reveal progression, improvement, or stability of findings, requiring parents to cope with ongoing uncertainty throughout the pregnancy.[10] Prognostic uncertainty represents a particularly challenging aspect of structural anomaly diagnosis. Even when a condition is definitively diagnosed, predicting long-term outcomes, quality of life, and developmental potential often remains uncertain, particularly for rare conditions with limited research literature or significant phenotypic variability.[11,12]

Theoretical frameworks for understanding uncertainty

Uncertainty in illness theory

Mishel's Uncertainty in Illness Theory provides a valuable framework for understanding how individuals process and respond to medical uncertainty. According to this theory, uncertainty occurs when individuals cannot adequately structure or categorize illness-related events due to insufficient cues, lack of familiarity, or inconsistency of information.[13] In the prenatal context, uncertainty manifests when expectant parents receive probabilistic or inconclusive diagnostic information that cannot be easily categorized as "normal" or "abnormal". The theory suggests that uncertainty appraisal is influenced by credible authority figures (healthcare providers), social support and education levels, making these factors critical in determining psychological responses to uncertain prenatal diagnoses.[14] The theory's emphasis on meaning-making processes is particularly relevant to prenatal diagnosis, where parents must construct an understanding of complex medical information while simultaneously processing the emotional implications for their expected child and family future.

Stress and coping theory

Lazarus and Folkman's Stress and Coping Theory offers insights into how expectant parents respond to uncertain prenatal diagnoses.[15,16] The theory's emphasis on cognitive appraisal processes explains why identical diagnostic information may generate vastly different psychological responses among different individuals. Primary appraisal involves evaluating the personal significance and potential threat posed by uncertain diagnostic information. Secondary appraisal focuses on available coping resources and options for managing the situation. The interaction between these

appraisal processes determines whether uncertainty is perceived as challenging, threatening, or potentially manageable. Some parents may engage in intensive information seeking and additional testing (problem-focused), while others may focus on emotional regulation and meaning-making (emotion-focused) as coping strategies, which helps explain diverse responses to prenatal uncertainty.

Attachment theory considerations

Prenatal attachment theory suggests that emotional bonds between parents and their expected child develop throughout pregnancy, influenced by multiple factors including perceived fetal health and viability.[17,18] Uncertain diagnostic information can significantly disrupt this bonding process, as parents may emotionally protect themselves by reducing attachment intensity until diagnostic clarity is achieved. The concept of "conditional bonding" emerges when parents consciously or unconsciously withhold full emotional investment in their pregnancy until uncertain diagnoses are resolved. This protective mechanism, while psychologically understandable, can create additional distress and guilt for parents who feel unable to fully embrace their pregnancy.

Psychological impact on expectant parents

The psychological impact of uncertain prenatal diagnosis is multi-factorial Figure 2.

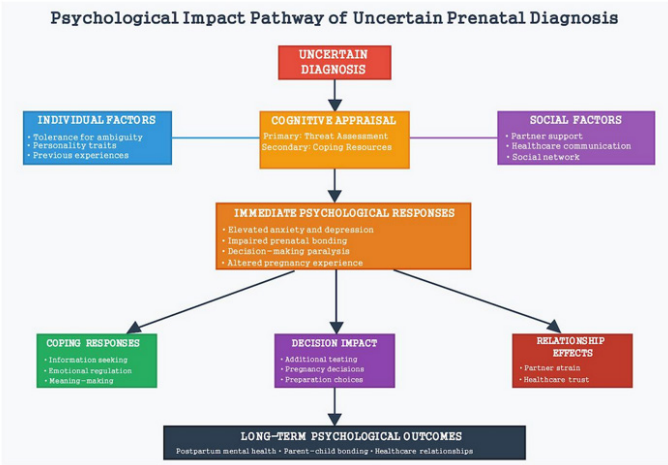

Figure 2 Psychological impact pathway of uncertain prenatal diagnosis.

Immediate psychological responses

Research consistently demonstrates that uncertain prenatal diagnoses generate significant psychological distress, typically manifesting as elevated anxiety and depression symptoms that exceed those observed in pregnancies with definitive normal or abnormal diagnoses.[19,20] The ambiguous nature of unknown results appears to be more psychologically challenging than receiving definitively abnormal results, as it prevents the cognitive processing and adaptation that occurs with clear diagnostic information. Anxiety responses to uncertain diagnoses involve both generalized worry and specific obsessive thoughts about foetal health and development. Parents frequently report intrusive thoughts, sleep disturbances, and hypervigilance regarding pregnancy symptoms. The probabilistic nature of screening results can generate persistent worry, as parents struggle to interpret percentage risks in meaningful personal terms.

Depression symptoms may emerge as parents experience a sense of loss of the "normal" pregnancy experience they had anticipated. The joy and excitement typically associated with pregnancy may be replaced by worry, fear, and emotional numbness as parents attempt to protect themselves from potential future disappointment.[21] Cognitive processing difficulties are common, with parents reporting inability to concentrate, make decisions, or engage in routine activities. The mental energy required to process complex medical information while managing emotional distress can overwhelm normal cognitive functioning.[19]

Impact on pregnancy experience

Uncertain diagnoses fundamentally alter the subjective experience of pregnancy, transforming what should be a celebratory period into one characterized by vigilance and worry. Parents often report feeling unable to enjoy pregnancy milestones such as feeling foetal movement, planning the nursery, or sharing news with family and friends.[21] Prenatal bonding, the emotional attachment that typically develops throughout pregnancy, may be significantly impaired by diagnostic uncertainty. Parents may consciously or unconsciously create emotional distance from their pregnancy as a protective mechanism against potential loss or disappointment. This bonding disruption can persist even after favorable outcomes, potentially affecting long-term parent-child relationships.

Decision-making challenges

The most psychologically challenging aspect of uncertain prenatal diagnoses involves the complex decisions parents must make with incomplete information. Unlike medical decisions that can be deferred pending additional information, pregnancy-related decisions often occur within specific gestational time windows. The decision about whether to pursue more diagnostic testing presents a complex risk-benefit analysis that must account for procedural risks, accuracy limitations, and emotional consequences. Parents must weigh the psychological benefits of obtaining additional information against the risks of invasive procedures and the possibility of receiving additional uncertain results. Preparation decisions present ongoing challenges throughout pregnancies with uncertain diagnoses. Parents must decide how much to invest emotionally and practically in pregnancy preparation while uncertainty persists, creating an ongoing tension between hope and protective emotional distancing.

Factors influencing psychological responses

Individual Characteristics: Personal tolerance for ambiguity represents a crucial individual difference factor that significantly influences psychological responses to uncertain prenatal diagnoses.[22] Individuals with low tolerance for ambiguity experience greater distress when facing uncertain medical information, while those with higher tolerance may adapt more readily to probabilistic results.

Personality factors, particularly neuroticism and trait anxiety, predict greater psychological distress in response to uncertain diagnoses.[23] Parents with higher baseline anxiety levels are more likely to interpret uncertain results catastrophically and experience persistent worry throughout their pregnancy. Previous pregnancy experiences significantly influence responses to current uncertainty. Parents with histories of pregnancy loss, infertility, or previous abnormal diagnoses may be particularly vulnerable to distress when facing new uncertainties. Conversely, parents with successful previous pregnancies may have greater confidence in positive outcomes.

Educational background and health literacy affect the ability to understand and process complex medical information, with some studies suggesting that higher education levels may be associated with greater distress due to increased awareness of potential negative outcomes. Religious and cultural beliefs profoundly influence

responses to uncertain diagnoses, affecting both interpretation of medical information and decision-making processes. Some belief systems may provide comfort and a framework for meaning-making, while others may create additional psychological burden through conflicts between medical and spiritual perspectives.

Social support factors

Partner support quality represents the most significant social factor influencing psychological adjustment to uncertain prenatal diagnoses. Strong partner relationships characterized by open communication and mutual support facilitate better psychological outcomes, while relationship strain or disagreement about medical decisions exacerbate distress.[24,25]

The quality of relationships with healthcare providers significantly affects psychological responses to uncertainty. Parents who perceive their providers as knowledgeable, communicative, and emotionally supportive report lower distress levels and greater confidence in their ability to manage uncertain situations.

Extended family and social network support can provide crucial emotional resources, though it may also create additional pressure if family members have strong opinions about medical decisions or pregnancy management. The stigma associated with genetic conditions or pregnancy termination within some social networks can increase psychological burden.

Long-term psychological consequences

Postpartum Mental Health: The psychological impact of uncertain prenatal diagnoses often extends well beyond delivery, with research indicating elevated rates of postpartum depression and anxiety among mothers who experienced significant uncertainty during pregnancy.[26,27] Even when pregnancies result in healthy babies, the psychological trauma of uncertain diagnoses may persist.

Post-traumatic stress symptoms may develop in some parents, particularly those who experienced severe distress during the uncertainty period or who underwent invasive diagnostic procedures.[19] Intrusive memories of receiving uncertain results, avoidance of pregnancy-related triggers, and hypervigilance about child health may characterize these responses. The resolution of uncertainty through favourable outcomes does not necessarily eliminate psychological consequences, as some parents report persistent anxiety about their child's health and development that may interfere with normal parenting confidence and enjoyment.

Parent-Child Relationship: Prenatal bonding disruption caused by uncertain diagnoses may have lasting effects on parent-child relationships. Parents who maintained emotional distance during pregnancy may experience difficulty fully connecting with their child after birth, despite favourable outcomes. Overprotective parenting behaviours may emerge as parents attempt to control factors that feel manageable after experiencing the powerlessness associated with uncertain diagnoses. This overprotection may interfere with normal child development and family functioning. Some parents report ongoing guilt about their emotional responses to uncertain diagnoses, particularly if they considered pregnancy termination or experienced reduced bonding during pregnancy affecting their confidence as parents and their relationship with their child.[28]

Healthcare Relationships: Parents who felt adequately supported during uncertain diagnoses may maintain strong trust in medical care, while those who felt abandoned or poorly informed may develop lasting skepticism about medical recommendations. Compliance with medical recommendations in future pregnancies may be affected by previous experiences with uncertainty, with some parents becoming hypervigilant about medical care while others may avoid or delay prenatal care due to anxiety about receiving uncertain results. The experience of navigating uncertain diagnoses may affect parents' approach to their children's healthcare, potentially influencing decisions about genetic testing, preventive care, and medical intervention throughout their children's lives.

Coping strategies and interventions

Individual Coping Mechanisms

Parents employ diverse coping strategies when facing uncertain prenatal diagnoses,[29,30] with significant individual variation in the approaches that provide comfort and stress relief. Information seeking is a common coping strategy, with some parents researching their specific situation while others deliberately limit information exposure to reduce anxiety. Cognitive reframing and meaning-making processes help some parents adapt to uncertainty by focusing on factors within their control or finding positive aspects of their situation. Spiritual and religious coping may provide comfort through prayer, faith community support, or belief systems that offer frameworks for understanding difficult circumstances.[31] Avoidance coping, while potentially maladaptive if extreme, may serve protective functions during acute distress periods. Some parents benefit from temporarily limiting pregnancy-related activities or discussions while they process uncertain information and develop coping resources.

Psychosocial interventions

Genetic counselling represents the primary professional intervention for parents facing uncertain diagnoses, providing both informational support and psychological guidance. Effective genetic counselling addresses both the medical aspects of uncertain results and the emotional impact on parents, using techniques such as reflective listening, normalization of emotional responses, and collaborative decision-making support.[32] Individual psychological counselling may be beneficial for parents experiencing severe distress, particularly those with pre-existing mental health conditions or additional stressors.[33] Cognitive-behavioural therapy techniques can help parents develop coping strategies for managing anxiety and catastrophic thinking patterns.

Support groups, both in-person and online, provide opportunities for parents to connect with others facing similar situations. Peer support can reduce feelings of isolation and provide practical advice for managing uncertainty, though careful screening and professional facilitation may be necessary to ensure positive outcomes.

Mindfulness-based interventions have shown promise in helping parents manage the emotional intensity of uncertain diagnoses.[34,35] Techniques such as meditation, deep breathing, and body awareness can provide tools for managing acute anxiety and developing tolerance for uncertainty.

Communication strategies

Effective communication between healthcare providers and parents is crucial for minimizing the psychological impact of uncertain diagnoses.[36] Providers should use clear, jargon-free language when explaining probabilistic information, using visual aids and analogies to help parents understand statistical concepts. Shared decision-making approaches that acknowledge parents as experts on their own values and preferences can help reduce the psychological burden of difficult decisions. Providers should explicitly acknowledge the emotional

difficulty of uncertain diagnoses while providing realistic hope and support. Written information and resources can supplement verbal communication, allowing parents to review complex information at their own pace and reducing the cognitive burden of processing multiple types of information simultaneously (Figure 3).

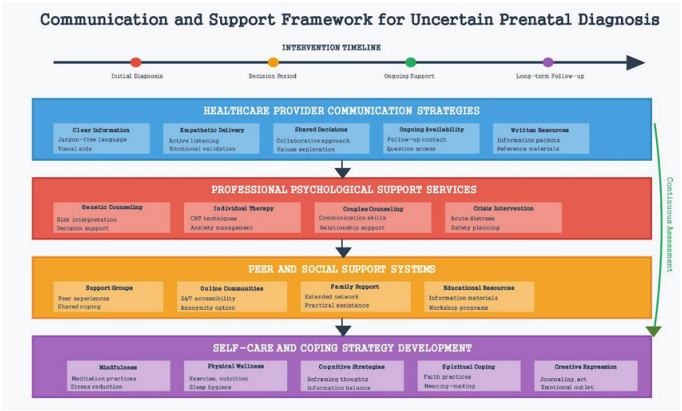

Figure 3 Theoretical framework integration for prenatal diagnostic uncertainty.

Clinical implications and recommendations

Healthcare system considerations

Healthcare systems must recognize that uncertainty is an inherent aspect of modern prenatal care that requires dedicated resources and expertise. Integration of psychological support services into prenatal care programs is essential for addressing the complex emotional needs of families facing uncertain diagnoses.

Recent developments in risk stratification frameworks offer promising approaches to managing uncertainty in prenatal counselling. The Management, Outcome, Risk, and Expectation (MORE) classification system proposed by Goel et al.,[11] provides a comprehensive yet practical framework for categorizing structural foetal anomalies to aid antenatal counseling and decision-making. This system addresses the limitation of traditional binary classifications (surgically correctable versus incompatible with life) by incorporating four key dimensions: Management requirements (M1-M5, ranging from normal delivery to termination options), Outcome predictions (O1-O5, from normal life compatibility to life-threatening conditions), Risk assessment for future pregnancies (R1-R3), and Expectation considerations including parental preferences and circumstances (E1-E3). By providing structured categories that can be combined in various permutations, the MORE classification enables healthcare providers to offer more nuanced, personalized counseling that acknowledges the complexity of uncertain diagnoses while providing families with clearer frameworks for decision-making. Such systematic approaches represent important advances in translating the psychological understanding of uncertainty into practical clinical tools.[11]

Provider training programs should emphasize uncertainty communication skills, emotional support techniques, and recognition of psychological distress indicators. Healthcare professionals need specific training in discussing probabilistic information and supporting parents through difficult decision-making processes. Quality improvement initiatives should assess not only medical outcomes but also psychological outcomes and family satisfaction with support received during periods of uncertainty. Patient feedback regarding communication quality and emotional support should guide system improvements (Figure 4).

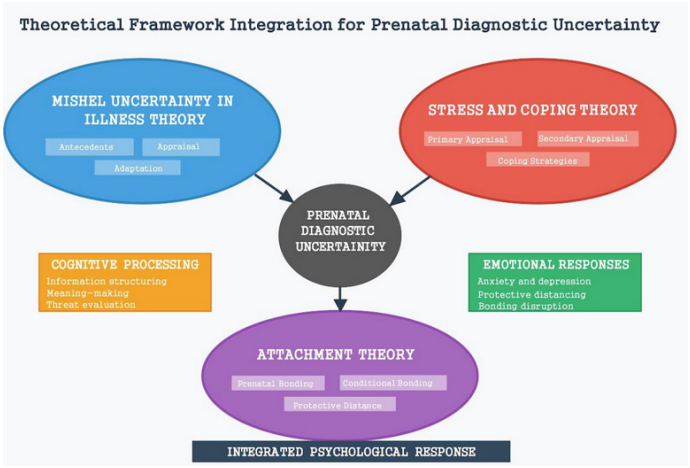

Figure 4 Communication and support intervention framework for uncertain prenatal diagnosis.

Policy implications

Professional guidelines for prenatal screening and diagnosis should include explicit recommendations for psychological support and counseling services. Standards of care should address both medical and psychological aspects of uncertain diagnoses. Informed consent processes for prenatal testing should include discussion of the possibility of uncertain results and available support resources. Parents should understand that testing may generate complex information requiring difficult decisions before they agree to screening or diagnostic procedures. Insurance coverage for psychological support services related to uncertain prenatal diagnoses should be considered essential rather than optional, recognizing the significant impact of these experiences on family well-being.

Conclusions

Uncertainty in prenatal diagnosis represents a significant psychological challenge that affects expectant parents in the era of advanced genetic and imaging technologies. The assumption that technological advancement automatically improves patient outcomes fails to account for the complex psychological implications of probabilistic and inconclusive results. This extends far beyond the immediate distress experienced when results are received, affecting pregnancy experience, parent-child bonding, decision-making processes, and long-term mental health outcomes. Individual differences in tolerance for ambiguity, social support resources, and healthcare communication quality significantly influence the magnitude and duration of psychological effects.

Healthcare systems must evolve beyond purely medical models of prenatal care to embrace comprehensive approaches that address both physical and psychological aspects of uncertain diagnoses, requiring investment in provider training, psychological support services, and system-wide recognition of uncertainty as a legitimate clinical concern requiring dedicated resources.

Future research should focus on developing and evaluating interventions specifically designed to support families through uncertain prenatal diagnoses, with particular attention to long-term outcomes and the development of resilience. The recognition that uncertainty is not a failure of modern medicine but rather an inevitable consequence of increased diagnostic sophistication represents an important paradigm shift. By acknowledging and actively addressing

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the psychological implications of uncertain prenatal diagnoses, healthcare systems can better support families through these challenging experiences while optimizing outcomes for both parents and children.

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Conflict of interests

Authors state no conflict of interest.

References

1. Ana Vičić, Tomislav Hafner, Ivanka Bekavac Vlatković, et al. Prenatal diagnosis of down syndrome: A 13–year retrospective study. *Taiwanese Journal of Obstetrics and Gynecology*. 2017;56(6):731–735.
2. Kancherla, V. Neural tube defects: a review of global prevalence, causes, and primary prevention. *Child S Nervous System*. 2023;39(7):1703–1710.
3. Wybo Dondorp, Guido de Wert, Yvonne Bombard, et al. Non–invasive prenatal testing for aneuploidy and beyond: challenges of responsible innovation in prenatal screening. *European Journal of Human Genetics*. 2015;23(11):1438–1450.
4. Raniga S, Desai PD, Parikh H. Ultrasonographic soft markers of aneuploidy in second trimester: are we lost? *MedGenMed*. 2006;11;8(1):9.
5. Moradi B, Bahrami A, Vafaei SM, et al. Diagnostic and prognostic role of soft ultrasound markers in prenatal detection and assessment of foetal abnormalities. *Prz Menopauzalny*. 2024;23(2):94–108.
6. Levy B, Hoffmann ER, McCoy RC, et al. Chromosomal mosaicism: Origins and clinical implications in preimplantation and prenatal diagnosis. *Prenat Diagn*. 2021;41(5):631–641.
7. American College of Obstetricians & Gynecologists (ACOG) Clinical. *ACOG*. 2016.
8. Bin Zhang, Lingna Zhou, Chuanshou Feng, et al. More attention should be paid to pregnant women who fail non–invasive prenatal screening. *Clinical Biochemistry*. 2021;96:33–37.
9. Buijtendijk MF, Bet BB, Leeflang MM, et al. Diagnostic accuracy of ultrasound screening for foetal structural abnormalities during the first and second trimester of pregnancy in low–risk and unselected populations. *Cochrane Database Syst Rev*. 2024;5(5):CD014715.
10. Hammond J, Klapwijk JE, Hill M, et al. Parental experiences of uncertainty following an abnormal foetal anomaly scan: Insights using Han's taxonomy of uncertainty. *J Genet Couns*. 2021;30(1):198–210.
11. Goel P, Agrawal V, Srinivasan RB. Management, outcome, risk, and expectation classification for structural fetal anomalies to aid antenatal counseling: a systematic review. *J Indian Assoc Pediatr Surg*. 2024;29(4):309–318.
12. Ramji N, Robinson ME, Moore GP. Challenges of uncertainty in prenatal decision–making: skeletal dysplasias. *The Journal of Law Medicine & Ethics*. 2024;52(2):459–466.
13. Mishel MH. Uncertainty in illness. *Image the Journal of Nursing Scholarship*. 1988;20(4):225–232.
14. Mishel MH. Parents perception of uncertainty concerning their hospitalized child. *Nursing Research*. 1983;2:324–330.
15. Folkman S, Lazarus RS, Gruen RJ, et al. Appraisal, coping, health status, and psychological symptoms. *J Pers Soc Psychol.* 1986;50(3):571–579.
16. Biggs A, Brough P, Drummond S. Lazarus and Folkman's psychological stress and coping theory. In: CL Cooper, JC Quick, editors. The handbook of stress and health: A guide to research and practice. Wiley Blackwell; 2017. p. 351–364.
17. Trombetta T, Maura Giordano, Fabrizio Santoniccolo, et al. Prenatal attachment and parent–to–infant attachment: a systematic review. *Frontiers in Psychology*. 2021;12.
18. Brandon AR, Pitts S, Denton WH, et al. A history of the theory of prenatal attachment. *J Prenat Perinat Psychol Health*. 2009;23(4):201–222.
19. Hansen K, Mische Lawson L, et al. Prenatal psychosocial distress screening for individuals experiencing pregnancies complicated by fetal anomalies. *J Pers Med*. 2025;15(7):322.
20. Kim AJH, Servino L, Bircher S, et al. Depression and socioeconomic stressors in expectant parents with Fetal congenital anomalies. *J Matern Fetal Neonatal Med*. 2022;35(25):8645–8651.
21. Dunkel Schetter C, Tanner L. Anxiety, depression and stress in pregnancy: implications for mothers, children, research, and practice. *Curr Opin Psychiatry*. 2012;25(2):141–148.
22. Richardson A, Raine–Fenning N, Deb S, et al. Anxiety associated with diagnostic uncertainty in early pregnancy. *Ultrasound Obstet Gynecol.* 2017;50(2):247–254.
23. Lu D, Yang J, Shen W, et al. Attitudes toward uncertain results from prenatal exome sequencing: a national survey among healthcare professionals working in the prenatal setting. *Front Med (Lausanne).* 2024;11:1335649.
24. Lou S, Nielsen CP, Hvidman L, et al. Coping with worry while waiting for diagnostic results: a qualitative study of the experiences of pregnant couples following a high–risk prenatal screening result. *BMC Pregnancy Childbirth*. 2016;16(1):321.
25. Stapleton LR, Schetter CD, Westling E, et al. Perceived partner support in pregnancy predicts lower maternal and infant distress. *J Fam Psychol.* 2012;26(3):453–463.
26. Carlson K, Saba Mughal, Yusra Azhar, et al. Perinatal depression. 2025.
27. Howard LM, Khalifeh H. Perinatal mental health: a review of progress and challenges. *World Psychiatry*. 2020;19(3):313–327.
28. Patel R, Friedrich B, Sanderson SC, et al. Anxiety and quality–of–life for parents of children with undiagnosed rare conditions: A multi–site quantitative survey study. *J Genet Couns*. 2025;34(4):e70085.
29. Irani M, Khadivzadeh T, Asghari–Nekah SM, et al. Coping Strategies of Pregnant Women with Detected Fetal Anomalies in Iran: A Qualitative Study. *Iran J Nurs Midwifery Res*. 2019;24(3):227–233.
30. Zhang T, Chen WT, He Q, Li Y, Peng H, Xie J, Hu H, Qin C. Coping strategies following the diagnosis of a Fetal anomaly: A scoping review. *Front Public Health*. 2023;11:1055562.
31. Farideh Khavari, Nahid Golmakani, Azadeh Saki, et al. The Relationship between Prenatal Coping Strategies and Irrational Beliefs in Pregnant Woman. *Journal of Midwifery and Reproductive Health*. 2018;6(2):1215–1222.
32. Bernhardt BA, Kellom K, Barbarese A, et al. An exploration of genetic counselors' needs and experiences with prenatal chromosomal microarray testing. *J Genet Couns*. 2014;23(6):938–947.
33. Ponting C, Chavira DA, Dunkel Schetter C, et al. Cognitive behavioral stress management effects on prenatal anxiety among low–income women. *J Consult Clin Psychol*. 2022;90(2):148–160.
34. Kundarti FI, Kiswati N, Komalyna INT. Mindfulness based intervention reduce anxiety in labor. *Gaceta Sanitaria*. 2024;38:102359.
35. Rice FK. Center for Mindfulness & compassion at Cambridge Health Alliance, McLean Hospital, Mount Auburn Hospital Dept. of Psychiatry, Lesley. University Mindfulness–Based Interventions for prenatal stress, anxiety, and depression, expressive therapies capstone theses. 2021.
36. Spiel M, Roth EM, Merz–Herrala AA, et al. Communicating uncertainty with perinatal counseling: a randomized controlled trial of a multimodal curriculum for obstetrical trainees. *AJOG Glob Rep*. 2025;5(3):100535.