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"Clinical Perspectives on a Cerebral Palsy Prevention Algorithm: Results from a Physician Survey"

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ABSTRACT:

Background: Cerebral palsy (CP) remains a major childhood disability, with early detection hindered by inconsistent screening practices and limited structured tools. Standardized algorithms may improve risk identification, but their acceptance among clinicians must be established to ensure successful implementation.

Aim: To evaluate physicians' perceptions regarding the clinical relevance, applicability, and gap-addressing potential of a newly developed CP prevention algorithm.

Methods: A descriptive, cross-sectional survey was conducted among 50 physicians from neonatal, paediatric, and rehabilitation specialties in Maharashtra, India. A validated questionnaire assessed perceptions of relevance, utility, feasibility, and the need for additional algorithms. Quantitative data were analysed using descriptive statistics, and qualitative inputs were interpreted using thematic analysis.

Results: The algorithm received strong endorsement, with 74% of physicians rating it as highly or very relevant. Similarly, 74% reported that the algorithm addresses current gaps very well or excellently, indicating strong confidence in its capacity to standardize early CP risk assessment. All respondents (100%) supported the development of additional algorithms for neurodevelopmental screening. Qualitative feedback emphasized the need for digital integration and broader applicability across varied resource settings.

Conclusion: Physicians demonstrated high acceptance of the CP prevention algorithm, highlighting its potential to enhance early risk identification. Wider validation, digital deployment, and integration into routine neonatal workflows may strengthen its impact on CP prevention.

KEYWORDS: Cerebral palsy, Prevention algorithm, Early detection, Neonatal risk assessment, Physician perception.

INTRODUCTION:

Cerebral palsy (CP) is the most prevalent motor disability affecting children globally, characterized by a group of permanent disorders that impair movement, posture, and motor function due to non-progressive disturbances in the developing brain during fetal or infant stages. The condition imposes significant lifelong challenges on affected individuals and their families, resulting in substantial socioeconomic and healthcare burdens worldwide. Despite advancements in neonatal and perinatal care, the incidence of CP remains considerable, highlighting the urgent need for effective preventive strategies. The etiology of CP is multifactorial, encompassing prenatal, perinatal, and postnatal risk factors such as prematurity, birth asphyxia, infections, and genetic influences. Early identification of infants at risk and timely interventions play vital roles in mitigating the severity or even preventing the onset of CP. Recently, algorithmic and machine learning approaches have shown promise in improving early detection and prediction of CP risk, allowing clinicians to target preventive measures more effectively [1] [7]. Nonetheless, the success of such innovative algorithms in clinical practice hinges on their acceptance, usability, and adaptability by healthcare providers, particularly in resource-limited settings. There is a critical gap in the literature regarding the practical implementation and frontline clinician perspectives on CP prevention algorithms within the Indian healthcare context, where the burden of CP is significant, and healthcare infrastructure varies widely. In response to this need, we developed a novel cerebral palsy prevention algorithm rooted in evidence-based clinical parameters tailored for neonatal and pediatric care settings. This study aims to assess the algorithm's clinical feasibility, perceived efficacy, and implementation barriers through a structured survey of physicians practicing in Maharashtra, India.

By capturing valuable insights directly from frontline clinicians, this research seeks to inform iterative refinements of the algorithm and enhance its real-world applicability. Ultimately, this study contributes to bridging the gap between cerebral palsy preventive innovation and effective clinical adoption, supporting the broader goal of reducing CP incidence and improving developmental outcomes through proactive healthcare interventions. [2] [3] [4].

METHODS:

Study Design and Setting:

A descriptive, cross-sectional survey was undertaken to investigate physician perspectives on the practical implementation of a newly developed cerebral palsy prevention algorithm. The survey targeted doctors involved in neonatal, pediatric, and rehabilitation care across government and private medical institutions in Maharashtra, India. The study protocol complied with the ethical standards outlined in the Declaration of Helsinki, and institutional review board approval was obtained before commencement.

Participants:

Participants were practicing doctors from government and private medical institutions, with specialties relevant to cerebral palsy prevention and management. Convenience sampling was employed to recruit respondents who met the inclusion criteria of active clinical involvement in child healthcare and willingness to participate.

Inclusion Criteria:

- Licensed doctors currently practicing in Maharashtra, India
- Primary clinical responsibility in neonatal, pediatric, or rehabilitation medicine
- Direct involvement in patient care.
- Willingness and ability to provide informed consent and complete the survey.

Exclusion Criteria:

- Incomplete or duplicate survey responses
- Doctors under disciplinary review or suspension.
- Individuals with cognitive or language limitations affecting their ability to complete the survey.

Survey Instrument

The survey instrument comprised a validated, self-administered questionnaire divided into four main sections: Demographic and professional characteristics.

Awareness and initial impression of the cerebral palsy prevention algorithm Likert-scale items evaluating perceived utility, feasibility, and implementation concern. Open-ended questions for qualitative feedback and suggestions. The survey underwent expert review for content validity and was pilot tested with a subset of participants before field administration.

Data Collection

Physicians were recruited via institutional email lists, professional networks, and direct invitations. Surveys were distributed electronically and in paper format over six weeks. Participants received an information sheet about study objectives, data confidentiality, and their rights, along with the questionnaire.

Data Management

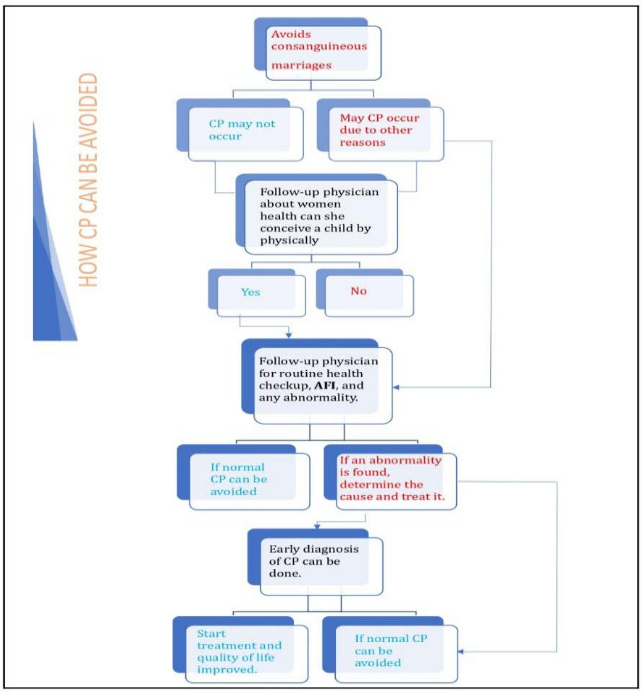
All completed responses were batch coded and entered into a secure, password-protected database. Individual identifiers were removed before analysis to maintain subject anonymity. Data validation protocols were implemented to verify the completeness and accuracy of entries; inconsistencies or duplicates were excluded from analysis.

Survey data were analyzed using Microsoft Excel for descriptive statistics. While qualitative responses underwent thematic analysis by two independent reviewers.

Data Analysis

Quantitative data were analyzed using descriptive statistics, including frequencies, percentages, means, and standard deviations, to summarize physician responses. Qualitative data from open-ended questions underwent thematic analysis to identify recurrent themes and insights relevant to algorithm refinement.

Fig.1: Cerebral Palsy (CP) prevention algorithm



RESULT:

A total of 50 physicians evaluated the clinical relevance of the newly developed Cerebral Palsy (CP) prevention algorithm. The responses demonstrated a strong positive inclination toward the algorithm's usefulness in real-world clinical settings.

Most participants rated the tool as either very or highly relevant, indicating high acceptance among clinicians.

Clinical Relevance Ratings:
Very Relevant – 46% of physicians
Highly Relevant – 28%
Moderately Relevant – 18%
Slightly Relevant – 8%
Not Relevant – 0%

These findings (Fig.2) indicate that 74% (46% + 28%) of respondents perceive the algorithm as strongly relevant, demonstrating confidence in its capacity to support early identification and risk assessment of infants at risk of cerebral palsy. Additionally, the absence of "Not relevant" responses emphasizes that all physicians recognized at least some degree of clinical value in the algorithm.

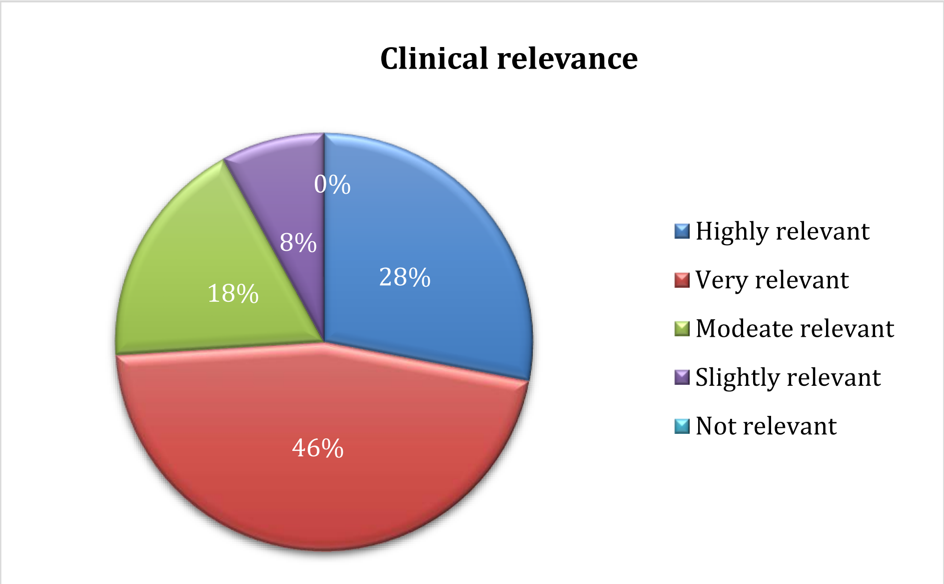


Fig.2: Clinical Relevance of the CP Prevention Algorithm

Physician feedback (n = 50) regarding the algorithm's capacity to address current gaps in early cerebral palsy risk identification demonstrated strong endorsement for its clinical value. Responses indicated that clinicians overwhelmingly view the algorithm as an effective tool capable of improving existing screening and assessment shortcomings.

Addressing Current Gaps – Response Distribution
Very Well – 21 physicians (42%)
Excellently – 16 physicians (32%)
Moderately – 11 physicians (22%)
Poorly – 1 physician (2%)
Not at all – 1 physician (2%)

Combined, **74% (42% + 32%)** of respondents stated that the algorithm addresses gaps *very well* or *excellently*, indicating strong clinical acceptance and recognition of its potential to enhance early detection and intervention pathways. Only a minimal fraction (4%) felt it performed poorly or not at all, suggesting near-universal acknowledgment of its usefulness.

These results (Fig.3) highlight that physicians perceive the algorithm as a significant improvement over existing unstructured or inconsistent risk assessment practices, particularly in resource-limited neonatal and pediatric care settings.

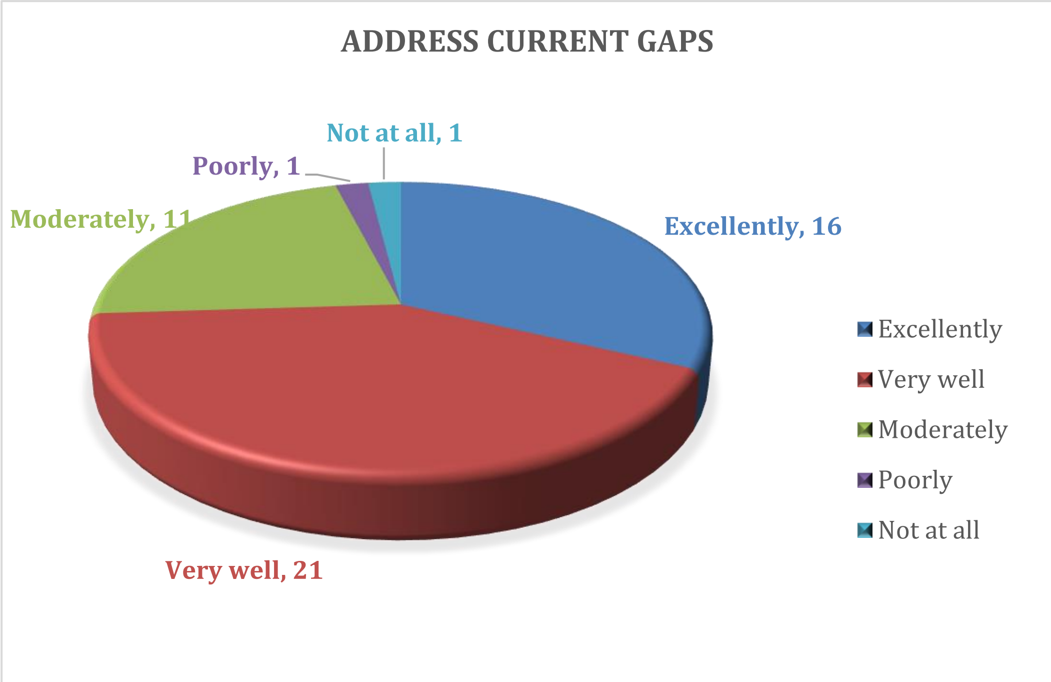


Fig.3: Physicians' Perception of the Algorithm's Ability to Address Current Gaps

All 50 participating physicians unanimously expressed the need for developing additional clinical algorithms related to early detection, prevention, and management of cerebral palsy and other neurodevelopmental disorders.

The survey revealed **100% agreement**, indicating strong professional support for expanding structured, evidence-based tools in pediatric and neonatal care.

Need to Generate More Algorithms – Response Distribution
Yes – 50 physicians (100%)
No – 0 physicians (0%)

This complete consensus demonstrates that clinicians recognize significant gaps in current screening frameworks and view algorithm-based decision-support tools as essential for improving healthcare outcomes. The uniform response suggests a widespread demand for structured clinical pathways to enhance diagnostic accuracy, reduce variability in care, and support early intervention strategies.

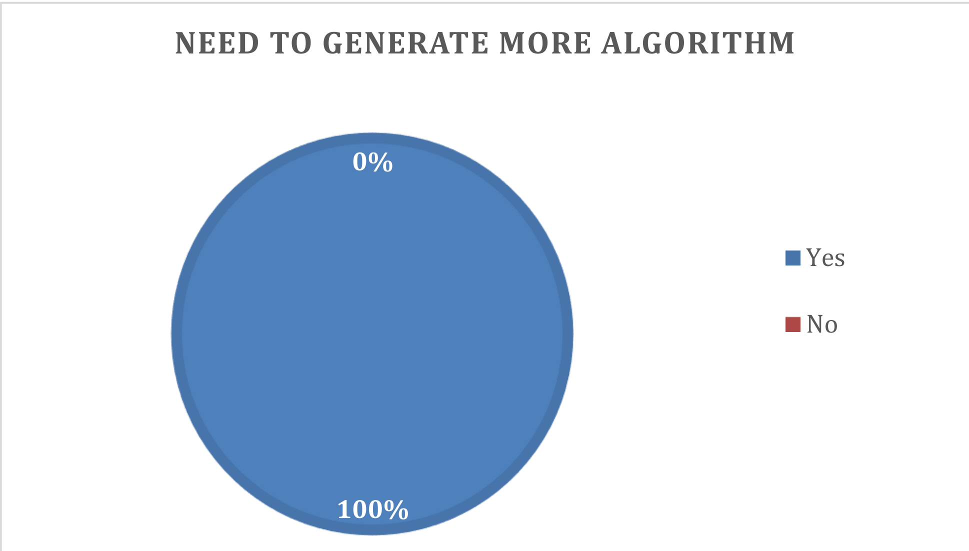


Fig.4: Physicians' Opinion on the Need to Develop Additional Algorithms

DISCUSSION:

The findings of this study provide compelling evidence of strong physician support for the newly developed Cerebral Palsy (CP) prevention algorithm. Across all domains assessed, clinical relevance, ability to address existing gaps, and the need for additional algorithmic tools, clinicians demonstrated consistently positive perceptions. This reinforces the growing recognition of the importance of standardized, evidence-based approaches in early neurodevelopmental screening and preventive neonatal care.

The high proportion of respondents rating the algorithm as *very relevant* or *highly relevant* (74%) reflects substantial clinical acceptance. This suggests that the algorithm effectively aligns with current clinical requirements and fills an important need in early CP risk identification. These findings are particularly significant in the Indian context, where variations in clinical expertise, documentation practices, and resource availability often hinder early detection efforts. The positive ratings indicate that the algorithm's structure, clarity, and applicability resonate well with frontline physicians responsible for neonatal and paediatric assessments.

Similarly, physician perception of the algorithm's ability to address existing gaps in CP risk assessment further strengthens its clinical value. A total of 74% of respondents rated the algorithm's capacity to address gaps as *very well* or *excellently*, highlighting its potential to streamline current practices and reduce inconsistencies inherent in unstructured clinical evaluation. The algorithm's emphasis on incorporating prenatal, perinatal, and early postnatal risk factors likely contributes to its perceived utility, particularly in settings where more advanced neurodevelopmental screening tools may not be readily accessible.

The unanimous agreement (100%) regarding the need to generate more clinical algorithms is a noteworthy finding. This suggests that clinicians recognize broader systemic gaps in neonatal and paediatric care and believe that algorithm-driven tools can improve diagnostic accuracy, optimize decision-making, and support early intervention. This reflects a shift toward protocol-based clinical practices and increased reliance on digitally supported screening pathways. Such perspectives also underscore the need for continuous innovation, expansion of risk-assessment models, and integration of technology-driven tools in routine care.

The collective results of this study emphasize that clinicians are receptive to adopting structured decision-support tools and view them as vital components of modern healthcare. However, the success of such tools depends on complementing clinical acceptance with appropriate implementation strategies, including clinician training, workflow integration, and digital adaptation. Incorporating the algorithm into mobile applications or electronic medical record systems could further enhance feasibility and uptake, particularly in resource-limited or high-volume healthcare settings.

Overall, the study demonstrates that the CP prevention algorithm is not only clinically relevant but also widely supported as a solution to existing practice gaps. The findings provide strong justification for advancing the development, refinement, and implementation of structured algorithms to strengthen early neurodevelopmental risk assessment and prevention strategies. With appropriate support, such tools have the potential to improve early detection, reduce preventable risk factors, and ultimately contribute to better long-term outcomes for infants at risk of cerebral palsy. [3] [7]

CONCLUSION:

The present study demonstrates that the newly developed cerebral palsy (CP) prevention algorithm is strongly supported by physicians for its clinical relevance, practicality, and ability to address existing gaps in early CP risk identification. The majority of clinicians recognized the algorithm as a valuable tool for standardizing neonatal and paediatric assessment, enhancing early detection, and guiding timely interventions. The unanimous agreement on the need for additional algorithms further highlights the demand for structured, evidence-based decision-support tools in child healthcare.

To maximize its impact, future efforts should focus on integrating the algorithm into digital platforms, strengthening clinician training, and validating its use across diverse healthcare settings. Overall, the algorithm shows significant potential to contribute to improved neurodevelopmental outcomes and reduce the burden of cerebral palsy through proactive, systematic risk assessment.

LIMITATIONS

Although the findings provide valuable insights, several limitations should be acknowledged.

First, the study utilized convenience sampling and included physicians primarily from Maharashtra, which may limit the generalizability of the results to wider national or international settings. The sample size of 50 physicians, while adequate for preliminary evaluation, may not fully capture the diversity of clinical perspectives across different healthcare levels.

Second, the survey relied on self-reported responses, which may introduce response bias, particularly regarding perceived relevance or acceptance of the algorithm.

Lastly, the study did not assess real-time clinical performance or patient outcomes, and therefore, the algorithm's effectiveness in actual practice was not directly measured.

FUTURE SCOPE

Future research should focus on validating the algorithm across larger and more diverse clinical populations, including multi-state or multi-country studies. Prospective clinical evaluations and pilot implementations in neonatal units would help assess real-world usability, accuracy, and impact on early CP detection. Integration of the algorithm into digital platforms such as mobile applications or EMR systems could further improve accessibility and adoption, particularly in resource-limited settings.

Additionally, developing complementary algorithms for other neurodevelopmental risk conditions and expanding predictive elements using machine learning or AI-based refinement may enhance screening precision. Longitudinal studies examining outcomes of infants assessed with the algorithm will also be essential to demonstrate its long-term clinical value.

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AUTHOR CONTRIBUTIONS

The author confirms sole responsibility for all aspects of this research work. This includes conceptualization, study design, development of the prevention algorithm, data collection, data curation, formal analysis, interpretation of findings, manuscript writing, revision, and final approval of the submitted version.: Kabra Vinay Shriram

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