E-B Environment - Behaviour Proceedings Journal

AicE-Bs2026Sokcho

e-IPH e-International Publishing House Ltd., United Kingdom

https://www.amerabra.org/index.php/aice-bs2026sokcho-04-06-jun-2026/

14th Asia-Pacific International Conference on Environment-Behaviour Studies

Kyungdong University Global (KDU Global),Sokcho (Goseong), South Korea, 04-06 Jun 2026

KAM-C Model of Myopia Management for School-aged Children

Ng Mam Yien[1], Madhubala Bava Harji[2], Fakhruddin Shamsheer Barodawala[3]

[1]Faculty of Optometry and Vision Science, SEGi University, Malaysia,
[2]Faculty of Education, Languages and Psychology, SEGi University, Malaysia
[3]Auckland Bioengineering Institute, University of Auckland, New Zealand.

mamyien86jocelyn@gmail.com, madhu7560@gmail.com; fakhruddin.barodawala@auckland.ac.nz
+60123399095

Abstract

Myopia has emerged as a significant public health concern, particularly among children in Malaysia, driven by lifestyle and environmental changes. Despite the availability of effective myopia control strategies, their adoption remains inconsistent, largely influenced by parental decision-making. This study employs a qualitative phenomenological approach to exploring parental awareness, knowledge, attitudes, and practices in myopia management. Guided by the Health Belief Model (HBM) and Theory of Planned Behavior (TPB), the study proposes the Knowledge–Attitude–Practice Clinical Integration (KAM-C) Model. The model integrates behavioral insights into clinical workflows to enhance treatment uptake, adherence, and long-term visual outcomes.

Keywords: Myopia; Parental Behavior; KAM-C Model; SDG 11; Sustainable Cities and Communities

1.0 Introduction

Myopia has become a significant global public health issue (Pan et al., 2024), particularly in Asia, where prevalence among school-aged children is increasing rapidly (George et al., 2023). The prevalence and progression of myopia have been hastened in Malaysia by environmental and behavioral changes, such as increased near work, extended use of digital devices, and decreased outdoor activity (Tan, Argawal and Teng, 2026). Early onset myopia significantly increases the risk of high myopia and associated ocular complications, including retinal detachment, glaucoma, and myopic maculopathy (Haarman et al, 2020). Despite the availability of evidence-based treatments such as orthokeratology, low-dose atropine, and specialized glasses, integrating them into standard clinical practice remains infeasible (Eppenberger et al., 2024). Parents' decision-making process plays a significant role in treatment adherence and acceptance (Hung et al., 2025). In pediatric eye care, parents are vital not merely for giving consent but also for influencing perceptions, beliefs, and behaviors (Liu et al.,2026). However, existing clinical frameworks do not adequately consider these behavioral factors. This study aims to fill this gap by introducing the KAM-C Model, which incorporates aspects of parental behavior into clinical decision-making to enhance outcomes in myopia management.

To address the lack of an HSP model for the Malaysian context, the following research questions are addressed in this article:

1. What is the level of parental awareness regarding myopia control interventions?
2. How do knowledge, attitudes, and practices contribute to the KAM-C Model integration?
3. What are the drivers of the KAM-C Model?

2.0 Literature Review

DOI:

This chapter reviewed childhood myopia, evidence-based interventions, parental behavioral influences, and the theoretical model underpinning the development of the KAM-C Model. Myopia has become a significant public health issue worldwide, especially in Asia (Pan et al., 2025). Malaysia has seen a rising incidence among school-aged children, driven by urban development, high use of digital devices, extended periods of near work, and less time spent outdoors (Tan et al., 2025). Environmental factors strongly influence the onset and course of myopia. Myopia can be prevented or its progression slowed by modifying environmental factors, such as time spent outdoors and near work (Biswas et al., 2024). The review assessed evidence-based strategies for managing myopia, including low-dose atropine, orthokeratology, multifocal contact lenses, and DIMS spectacle lenses, which help reduce axial elongation and slow the progression of refractive errors, thereby supporting the KAM-C Model (Lanca et al., 2023). Despite strong clinical evidence, adoption of these interventions remains inconsistent due to barriers such as cost, safety concerns, convenience, and limited parental awareness. The literature also highlighted the critical role of parental decision-making in pediatric eye care, as parents significantly influence treatment uptake, compliance, and adherence (Chang et al., 2024). The Health Belief Model (HBM) and the Theory of Planned Behavior (TPB), which together describe how attitudes, perceptions, subjective norms, and perceived behavioral control affect healthcare decisions, were used in this study to explain these behavioral patterns. This chapter highlights a notable shortcoming in the existing literature on myopia management in Malaysia: most studies emphasize prevalence and treatment efficacy but overlook systematic clinical models that account for parental behavioral influences in decision-making. Existing literature and clinical practice have widely recognized the relevance of behavioral theories such as the Health Belief Model and Theory of Planned Behavior, parental decision-making processes, and clinical integration strategies in myopia management. However, these elements often remain fragmented in practice. Therefore, this paper proposes the KAM-C Model as a structured framework to bridge parental decision-making and clinical integration, translating parental knowledge, attitudes, and practices into actionable clinical pathways that improve treatment uptake, adherence, and long-term myopia management outcomes.

3.0 Methodology

3.1 Research participants

This research adopts a qualitative phenomenological approach to investigate parents' experiences and decision-making processes in managing myopia. The study focused on parents' perceptions and decision-making regarding the management of childhood myopia. Using the Health Belief Model (HBM) and the Theory of Planned Behavior (TPB), it examined how parents' perceptions of risk, benefits, barriers, social influences, and behavioral control shaped decisions among 10 parents of children aged 6–12 years diagnosed with mild-to-moderate myopia ($\leqslant -6.00$ diopters).

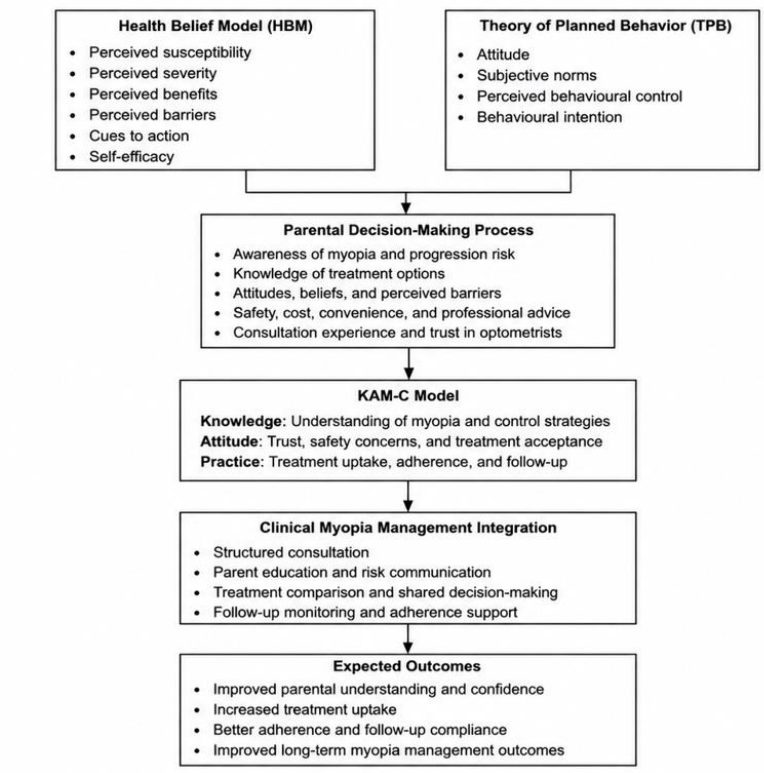

Fig.1. KAM-C Model

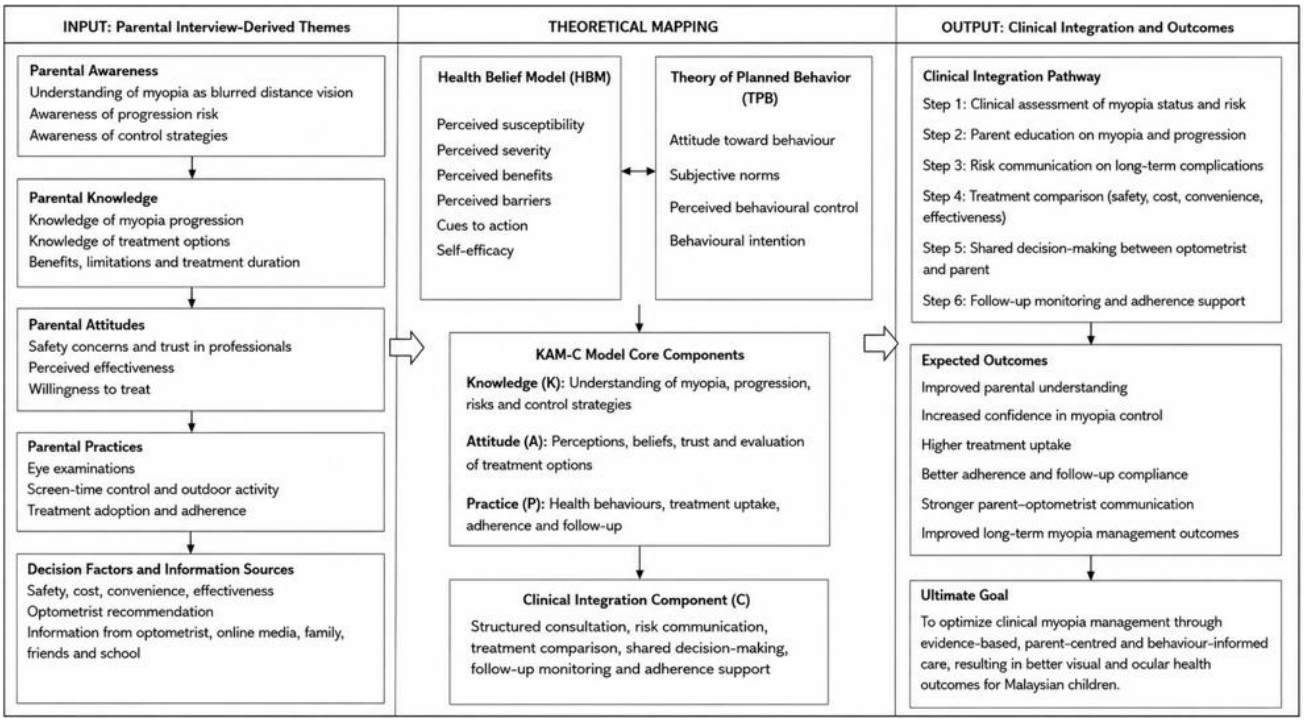

Fig.2. Knowledge-Attitude-Practice Clinical Integration (KAM-C) Model

3.2 Data collection

Data were collected through semi-structured interviews with parents at optometry clinics in the Klang Valley and subsequently analyzed in NVivo. Themes related to awareness, attitudes, barriers, and professional influences informed the development of the model, while ethical protections were upheld.

4.0 Findings

This section presents findings organized by themes derived from the semi-structured interviews. The themes are ordered by relevance to the research questions and by frequency of mention. Selected verbatim quotations from parents are included to support each theme. Participants are labeled P1 to P10 to ensure confidentiality.

4.1 Parental Awareness of Myopia

All participants demonstrated a basic understanding of myopia, a condition that causes nearsightedness and affects distance vision. Their awareness was mainly triggered by observable signs such as squinting, sitting close to the television, holding books near the face, or difficulty seeing the classroom whiteboard.

> …Myopia refers to short-sightedness. My child can see objects up close clearly, but when trying to focus on something far away, like the whiteboard in the classroom, the image becomes blurry… (P1)
> …The teacher mentioned that my child struggles to copy correctly from the board…(P2)
> …My child sits very close to the television and reads books with them held close to their face…(P3)

Parents recognized myopia primarily through blurred distance vision and increasing spectacle power, but their understanding was largely practical rather than clinical. This indicates the need for improved clinical education to support informed parental decision-making.

4.2 Perceived Severity and Risk of Myopia Progression

Parents expressed concern that myopia might worsen over time, especially since their children are young. Some respondents linked an increase in eyeglass prescriptions to potential future eye health issues. After optometrists explained the risks of high myopia and its long-term implications, the perceived seriousness of myopia increased.

> …I think it is quite serious because my child is still young. If the power continues to increase, it may become high myopia in the future…(P1)
> …Last time, I thought it was normal, and I could already wear glasses. However, after the optometrist explained the high risk of myopia, I feel it is more serious…(P2)
> …Serious because high myopia may cause eye problems later…(P4)

Parents' perception of myopia severity increased after a professional explanation, underscoring the importance of clinical communication. They were more likely to consider myopia control when they understood the risk of progression and long-term eye complications.

4.3 Knowledge of Myopia Control Strategies

Most parents learned about myopia control strategies only after a discussion with an optometrist. Commonly cited methods included myopia control glasses, orthokeratology lenses, atropine eye drops, and DIMS lenses. Although parents recognized these treatments, their understanding of how they work remained limited.

…Yes, I heard about special myopia-control lenses and Ortho-K lenses from the optometrist…(P1)
…I know about myopia-control spectacle lenses, Ortho-K contact lenses, and atropine eye drops…(P1)
…They help slow down the increase but cannot reverse the power. That is what I understand from the optometrist…(P5)

Parents generally understood that myopia control interventions could slow disease progression, yet many lacked understanding of treatment duration, expected outcomes, and comparative effectiveness. This highlights a critical gap between treatment awareness and meaningful understanding, underscoring the need for structured, parent-friendly education to translate clinical evidence into informed decision-making.

4.4 Parental Attitudes Toward Myopia Control

Parents generally held positive attitudes toward myopia management when treatments were perceived as safe, effective, and professionally recommended. However, their acceptance remained cautious, particularly because of concerns about contact lens hygiene, atropine-related side effects, and the safety of long-term treatment.

…I feel it is so important to my son, but I also need to understand more before I make a decision…(P1)
…Spectacle lenses seem okay and safer. Contact lenses need more care and concern…(P3)
…I am willing to try if it is safe…(P2)

Parental acceptance of myopia management was conditional rather than automatic, as parents needed reassurance before committing to treatment decisions. Trust in the optometrist, supported by clear, evidence-based explanations, played a crucial role in strengthening positive attitudes toward myopia control.

4.5 Decision-Making Determinants

Parents' treatment decisions were primarily influenced by safety, cost, convenience, effectiveness, and optometrist recommendations. They preferred myopia-control options that were safe, affordable, effective, and easy to integrate into their child's daily routine.

…Safety, the cost, and convenience, and the optometrist's recommendation…(P1)
…Costly and long-term, more safety…(P2)
…Safety, price, and child comfort…(P3)

Although parents recognized the importance of myopia management, financial constraints remained a major barrier to treatment adoption. This aligns with the Theory of Planned Behavior, in which perceived behavioral control, particularly affordability and practicality, influences whether parental intention translates into action.

4.6 Current Practices in Myopia Management

Parents adopted various myopia management practices, including regular eye examinations, reduced screen time, outdoor activity, the 20-20-20 rule, and myopia-control spectacle lenses. However, clinical intervention was not universal, as some parents remained in the decision-making stage before committing to treatment.

…Yes, we switched to myopia-control spectacle lenses and reduced screen time…(P1)
…We reduce tablet time and encourage outdoor play…(P3)
…We attend follow-up every six months…(P4)

Parental practices in myopia management ranged from lifestyle modification to clinical treatment adoption. Clear explanations and strong professional recommendations were key to converting parental awareness and intention into active myopia-control behavior.

4.7 Information-Seeking Behavior: Optometrists were consistently regarded as the most trusted and reliable source of information on childhood myopia management. Although parents accessed online platforms and social networks, professional guidance was preferred because it was perceived as more accurate, individualized, and relevant to the child's clinical condition.

…From an optometrist and sometimes from Google…(P1)
…Optometrist because they examine my child directly… (P1)
…Parenting groups have mixed opinions, so I trust professional advice more…(P5)

This finding underscores the pivotal role of optometrists as trusted health communicators in pediatric myopia management. While digital resources may raise general awareness, structured professional communication remains essential to strengthen parental understanding and guide informed treatment decisions.

4.8 Clinical Experience and Communication

Most parents reported positive consultation experiences when optometrists clearly explained their child's condition and available treatment options. However, some found the explanations too technical or too brief, underscoring the need for simple language, visual aids, written materials, and prescription progression charts to improve understanding.

…The optometrist's consultation was good. The optometrist explained the condition and treatment options clearly…(P1)
…Eye diagram and simple explanation…(P3)
…Good, but I need more time to ask questions… (P5)

Clear clinical communication was central to supporting parental confidence, particularly when risks, benefits, and treatment expectations were explained explicitly. This highlights the need for a standardized consultation pathway that integrates education, risk communication, and shared decision-making.

4.9 KAM-C Model Development Needs

Participants emphasized the need for clearer, more structured clinical guidance to support parental decision-making in myopia management. Their recommendations, including treatment comparison tables, visual aids, written care plans, follow-up reminders, and progress monitoring, directly informed the development of the KAM-C Model.

> …A clear explanation of treatment benefits, risks, costs, and follow-up plan…(P1)
> …Comparison between normal glasses and myopia control lenses…(P3)
> …Optometrists should provide risk communication, treatment comparisons, and follow-up monitoring… (P10)

The findings indicate that parents need more than clinical advice; they require a structured decision-support process that integrates knowledge, attitudes, and practices into routine myopia care. Accordingly, the KAM-C Model offers a clinical framework that translates parental behavioral insights into standardized consultation, risk communication, shared decision-making, and adherence support.

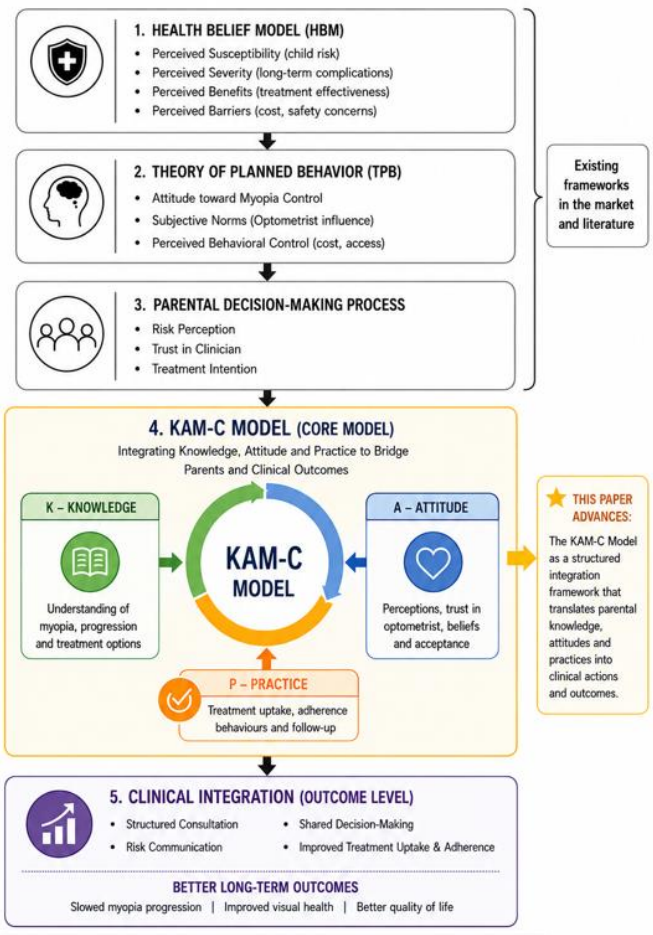

Fig. 3: Development and Advancement of the KAM-C Model

The creation of the (KAM-C) Model was informed by thematic insights from parental interviews and reinforced by the Health Belief Model (HBM) and the Theory of Planned Behavior (TPB). The model was developed through the following steps:

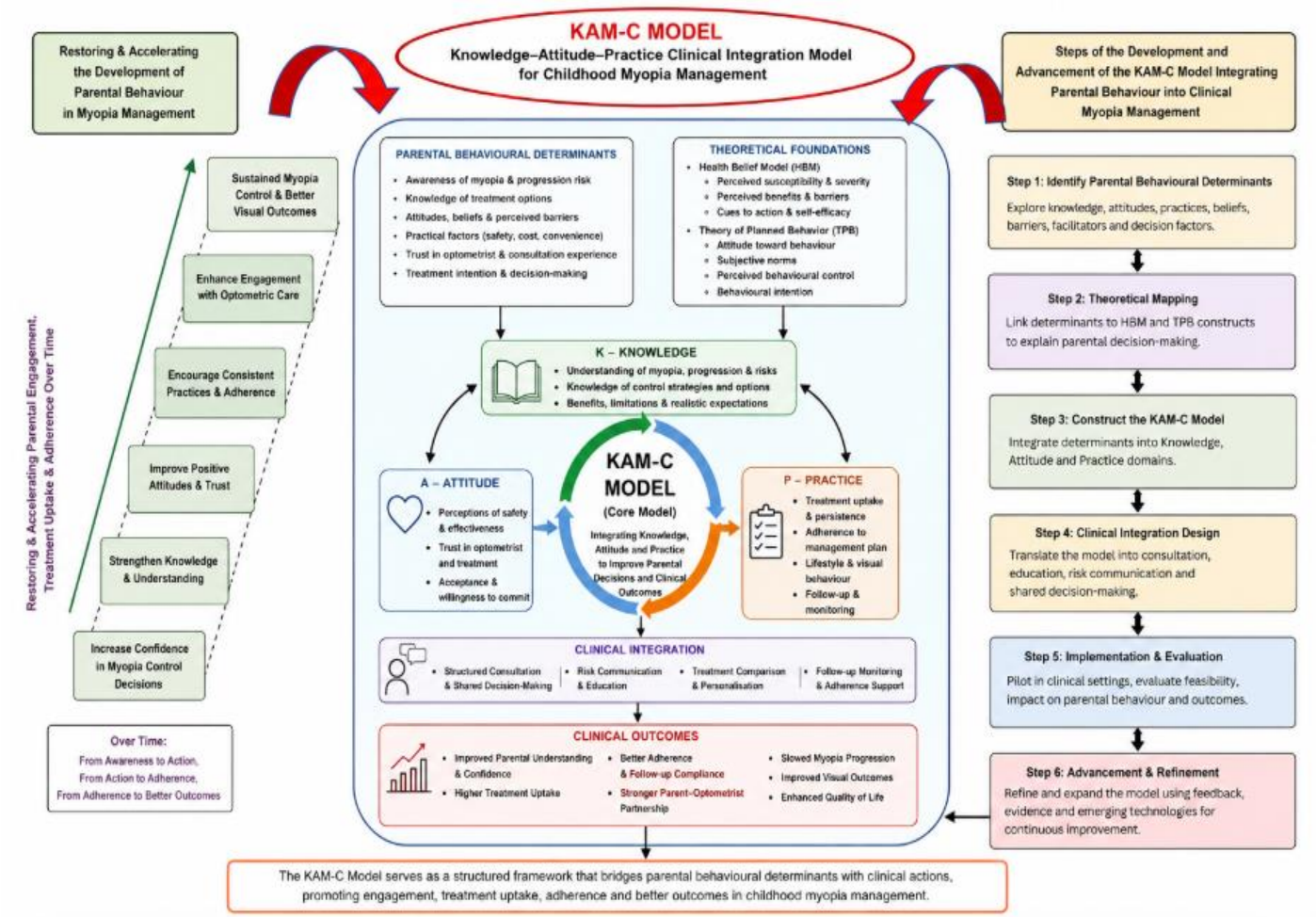

Fig.4. The KAM-C Model -Integrating Parental Behavior into Clinical Myopia Management

Left Figure	Centre Figure	Right Figure
1.) This illustrates the progressive development of parental behaviour in childhood myopia management. The upward movement represents the gradual transition from limited awareness to stronger knowledge, positive attitudes, consistent practices, and sustained adherence to myopia control. The smaller boxes reflect step-by-step behavioural advancement over time. Parents first recognize myopia risk, then seek information and professional advice, develop trust in treatment, adopt healthy visual habits, and eventually support long-term adherence. This process is presented as a linear upward progression for simplification. However, in real clinical settings, parental behaviour may move forward or backward depending on cost, safety concerns, child cooperation, family support, and consultation experience.	This represents the core of the KAM-C Model, where parental behavioural determinants are integrated into clinical myopia management. The model positions **Knowledge, Attitude, and Practice** as the central components linking parental decision-making with clinical action. Parents are influenced by awareness of myopia progression, perceived risk, treatment knowledge, attitudes toward safety and effectiveness, practical barriers, and trust in optometrists. These determinants shape their willingness to accept myopia control interventions. The KAM-C Model functions as a bridge between parental perceptions and clinical workflow. Through structured consultation, parent education, risk communication, treatment comparison, shared decision-making, and follow-up monitoring, optometrists can translate parental concerns into practical management plans.	This illustrates the development and advancement process of the KAM-C Model. The process begins with identifying parental behavioural determinants through interviews and literature review. These findings are then mapped to the Health Belief Model and Theory of Planned Behavior to explain how parents make treatment decisions. The model is subsequently constructed by integrating knowledge, attitude, and practice components into clinical consultation. It is then applied through structured communication, treatment explanation, shared decision-making, and adherence support. The final stage involves evaluation, refinement, and advancement of the model to improve parental engagement, treatment uptake, follow-up compliance, and long-term childhood myopia management outcomes.

Fig.5. Explanation of the Generated KAM-C Model: Clinical Myopia Management Integration

5.0 Discussion

This study found that parental decision-making is central to the management of childhood myopia. Although parents generally understood myopia as blurred distance vision, their knowledge of progression, long-term complications, and treatment mechanisms remained limited, indicating a gap between basic awareness and informed decision-making. The findings support the Health Belief Model, as parents were more likely to consider myopia control when they perceived progression as serious and relevant to their child. They also align with the Theory of Planned Behavior, as treatment uptake was shaped by attitudes, subjective norms, safety concerns, affordability, convenience, and perceived behavioral control. Optometrists were identified as the most trusted information source, highlighting the importance of clear professional communication. Parents preferred simple explanations, visual aids, treatment comparisons, and follow-up guidance. Therefore, the KAM-C Model was developed to translate parental knowledge, attitudes, and practices into structured clinical actions, including education, risk communication, shared decision-making, and adherence support.

6.0 Conclusion and Recommendations

This study concludes that childhood myopia management is strongly influenced by parental awareness, perceived risk, knowledge, attitudes, practical barriers, trust in optometrists, and consultation experience. Although parents were generally willing to consider myopia control, decisions were mainly shaped by safety, cost, convenience, perceived effectiveness, and professional recommendations. The study developed the Knowledge–Attitude–Practice Clinical Integration (KAM-C) Model, a structured clinical pathway designed to improve parental engagement, treatment uptake, adherence, and follow-up. By integrating parental behavioral factors into clinical decision-making, the model bridges the gap between evidence-based myopia-control interventions and routine clinical practice. Optometrists should adopt structured consultations involving parent education, risk communication, treatment comparison, shared decision-making, and follow-up monitoring. Clinics should support this process with visual aids, written care plans, progression charts, and comparison tables. Parents should seek early eye examinations, reduce excessive screen time, encourage outdoor activity, and maintain regular follow-up. Despite limitations related to the small urban sample and self-reported data, the KAM-C Model offers a practical framework for improving childhood myopia care and supports SDG 4: Quality Education and SDG 10: Reduced Inequalities in Malaysia.

7.0 Suggestions for Future Research

Future research should validate the KAM-C Model using larger and more diverse Malaysian samples, including urban, semi-urban, and rural populations. Quantitative and longitudinal studies are needed to examine its impact on parental knowledge, treatment uptake,

adherence, refractive progression, axial length control, and follow-up compliance. Future studies should include optometrists, ophthalmologists, teachers, and children to provide broader perspectives. Digital tools such as mobile applications, online decision aids, reminders, and interactive education platforms may further enhance parental engagement and long-term myopia management.

Acknowledgement
The authors gratefully thank the academics who volunteered to participate in interviews.

Paper Contribution to the Related Field of Study
This study advances paediatric optometry by developing the KAM-C Model, which integrates parental behavioral factors into clinical decision-making to improve communication, treatment uptake, adherence, and evidence-based care for childhood myopia in Malaysia.

References

Pan, W., Morgan, I., Flitcroft, I., Rose, K., Ostrin, L. A., Rosenfield, M., Govender-Poonsamy, P., Siu-Villaseñor, D., Kaymak, H., Khew, J. M., Woo, O., Tsubota, K., Shinde, L., Prenat, O., Ma, J., Qu, J., Yang, Z., Wang, Y., Tan, K. O., . . . Lan, W. (2025). The need to address the myopia pandemic: summary report of the global myopia public health summit 2024. *Global Health Research and Policy*, *10*(1), 45. https://doi.org/10.1186/s41256-025-00445-7

George, D., George, A., & Shahul, A. (2023). The Myopia epidemic: a growing public health crisis impacting children worldwide. *Zenodo (CERN European Organization for Nuclear Research)*. https://doi.org/10.5281/zenodo.8361064

Tan, E. S. Y., Agarwal, P., & Teng, C. L. (2026). Prevalence of Myopia in Children and Adolescents: A Systematic Review of Malaysian Prevalence Studies. Malaysian Journal of Medical Sciences, 33(1), 14–26. https://doi.org/10.21315/mjms-08-2025-592

Haarman, A. E. G., Enthoven, C. A., Tideman, J. W. L., Tedja, M. S., Verhoeven, V. J. M., & Klaver, C. C. W. (2020). The Complications of Myopia: A Review and Meta-Analysis. *Investigative Ophthalmology & Visual Science*, *61*(4), 49–49. https://doi.org/10.1167/iovs.61.4.49

Eppenberger, L. S., Grzybowski, A., Schmetterer, L., & Ang, M. (2024). Myopia control: Are we ready for an evidence-based approach? *Ophthalmology and Therapy*, *13*(6), 1453–1477. https://doi.org/10.1007/s40123-024-00951-w

Hung, L., Sun, C., Liao, L., Chang, L., & Chen, H. (2025). A web-based, user-centered decision aid to support parental choices in myopia control: A development and usability study. *Digital Health*, *11*, 20552076251395560. https://doi.org/10.1177/20552076251395560

Liu, S. M., Wang, Y. T., Chen, J., Wang, F., & Shih, S. F. (2026). Parent engagement in children's eye care behavior and vision-related quality of life: a cross-sectional study. BMC public health, 26(1), 879. https://doi.org/10.1186/s12889-026-26277-9

Pan, Z., Xian, H., Li, F., Wang, Z., Li, Z., Huang, Y., Liu, W., Li, Y., Li, F., Wang, J., Chen, H., Wu, Y., Xu, Y., Wu, G., Zhang, Y., He, L., Zhang, J., Zhang, F., Qian, X., & Zhang, X. (2025). Myopia and high myopia trends in Chinese children and adolescents over 25 years: a nationwide study with projections to 2050. *The Lancet Regional Health - Western Pacific*, *59*, 101577. https://doi.org/10.1016/j.lanwpc.2025.101577

Tan, E. S. Y., Agarwal, P., & Teng, C. L. (2026). Prevalence of myopia in children and Adolescents: A systematic review of Malaysian prevalence studies. *Malaysian Journal of Medical Sciences*, *33*(1), 14–26. https://doi.org/10.21315/mjms-08-2025-592

Biswas, S., Antonio El Kareh, Qureshi, M., Mei, D., Sun, C.-H., Janice S.H. Lam, Saw, S.-M., & Najjar, R. P. (2024). The influence of the environment and lifestyle on myopia. *Journal of Physiological Anthropology*, *43*(1). https://doi.org/10.1186/s40101-024-00354-7

Rashidi, N., Rahim, M. a. S. A., & Yusof, F. (2025, December 12). *Trend and distribution of refractive errors among children attending a private optometry practice in northern Malaysia*. https://journals.iium.edu.my/ijahs/index.php/IJAHS/article/view/1099

Maulvi, F. A., Desai, D. T., Kalaiselvan, P., Shah, D. O., & Willcox, M. D. P. (2025). Current and emerging strategies for myopia control: a narrative review of optical, pharmacological, behavioural, and adjunctive therapies. *Eye*, *39*(14), 2635–2644. https://doi.org/10.1038/s41433-025-03949-1

Lanca, C., Pang, C. P., & Grzybowski, A. (2023). Effectiveness of myopia control interventions: A systematic review of 12 randomized control trials published between 2019 and 2021. *Frontiers in Public Health*, *11*. https://doi.org/10.3389/fpubh.2023.1125000

Chang, L., Sun, C., Lee, T., Wang, Y., & Liao, L. (2024). Shared decision-making, treatment decision regret, and vision-related quality of life among parents of children with myopia: An online survey in Taiwan. *Contact Lens and Anterior Eye*, *47*(6), 102283. https://doi.org/10.1016/j.clae.2024.102283