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Use of a teachable machine in the epidemiological screening of glaucoma using a fundus image database for population-based screening

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INTRODUCTION: Glaucoma is the leading cause of irreversible blindness worldwide, and early diagnosis is essential to prevent significant visual loss. However, its often asymptomatic progression, combined with limited access to ophthalmologic evaluation in the Brazilian Unified Health System (SUS), contributes to delayed diagnosis. In this context, emerging technologies associated with artificial intelligence enable automated analysis of fundus images, expanding screening potential and improving public health outcomes. **OBJECTIVE**: To develop and evaluate the effectiveness of an artificial intelligence and machine learning–based system for automated analysis of fundus images, aiming to improve glaucoma screening and early diagnosis in primary care, with a focus on implementation in Basic Health Units within the SUS. **METHODS**: Fundus images from the public Kaggle database were used to train and test a machine learning model developed on the Teachable Machine platform. The training set included 520 images (134 positive and 386 negative), and the test set included 130 images (34 positive and 96 negative). Model performance was evaluated using accuracy, sensitivity, and specificity. **RESULTS**: The model achieved a sensitivity of 41.2%, specificity of 72.9%, accuracy of 64.6%, and a negative predictive value of 77.8%. **DISCUSSION**: In screening strategies, a high negative predictive value represents a relevant finding, indicating the model's potential to exclude unlikely cases and optimize referrals in primary care. However, the low sensitivity limits its safety, as it implies failure to detect a portion of positive cases. Thus, the system shows potential as a complementary tool. **CONCLUSION**: The use of machine learning demonstrates promising potential for glaucoma screening in the context of the SUS, particularly due to its ability to exclude negative cases. However, low sensitivity limits its standalone applicability. Further improvements, including expansion and balancing of datasets, incorporation of advanced deep learning techniques, and rigorous clinical validation, are necessary to enable its use as a reliable tool for early glaucoma detection.

KEYWORDS: Glaucoma; Artificial intelligence; Mass screening.

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