EVALUATION OF ARTIFICIAL INTELLIGENCE-POWERED SCREENING FOR SEXUALLY TRANSMITTED INFECTIONS-RELATED SKIN LESIONS USING CLINICAL IMAGES AND METADATA

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Background:
Sexually transmitted infections (STIs) pose a significant global public health challenge. Early diagnosis and treatment reduce STI transmission but rely on recognising symptoms and care-seeking behaviour of the individual. Digital health software that distinguishes STI skin conditions could improve health-seeking behaviour. We developed and evaluated a deep learning model to differentiate STIs from non-STIs based on clinical images and symptoms.

Methods:
We used 4,913 clinical images of genital lesions and metadata from the Melbourne Sexual Health Centre collected during 2010-2023. We developed two binary classification models to distinguish STIs from non-STIs: (1) a convolutional neural network (CNN) using images only and (2) an integrated model combining both CNN and Fully Connected Neural Network (FCN) using images and metadata. We evaluated the model performance by the Area under the ROC curve (AUC) and assessed metadata contributions to the Image-only model.

Results:
Our study included 1,583 STI and 3,330 non-STI images. Common STI diagnoses were syphilis (34.6%), genital warts (24.5%), and herpes (19.4%), while most non-STIs (80.3%) were conditions such as dermatitis, lichen sclerosis and balanitis. In both STI and non-STI groups, the most frequently observed groups were 25-34 years (48.6% and 38.2%, respectively), and heterosexual males (60.3% and 45.9%, respectively). The Image-only model showed a reasonable performance with an AUC of 0.859 (SD 0.013). The Image+Metadata model achieved a significantly higher AUC of 0.893 (SD 0.018) compared to the Image-only model ($p<0.01$). Out of 21 metadata, the integration of demographic and dermatological metadata led to the most significant improvement in model performance, increasing AUC by 6.7% compared to the baseline Image-only model.

Conclusions:
The Image+Metadata model outperformed the Image-only model in distinguishing STIs from other skin conditions. Using it as a screening tool in a clinical setting may require further development and evaluation with larger datasets.

Disclosure of Interest Statement:
No conflict of interest