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Comparison Between Clinical Observation and ChatGPT-Assisted Dental Assessment in School Children

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ABSTRACT

This observational cross-sectional comparative study was conducted at the Department of Community and Preventive Dentistry, Watim Dental College and Hospital, Rawalpindi, between March 2025 and September 2025, to compare the accuracy and consistency of clinical dental examinations with ChatGPT-assisted assessment in evaluating dental caries and oral hygiene among school children. Clinical oral examinations were performed on children aged 5–10 years using standard WHO oral health criteria, and the same intraoral images were analyzed using ChatGPT for caries detection and oral hygiene evaluation. The findings were compared for agreement using descriptive statistical methods. The AI-based assessment demonstrated an 87.5% agreement rate with clinical diagnosis for caries detection and 90% for oral hygiene evaluation, with minor discrepancies observed in borderline caries cases. The study concludes that ChatGPT shows promising accuracy in identifying dental caries and assessing oral hygiene, closely aligning with clinical observations, and has the potential to serve as a supportive tool in large-scale oral health screening and preventive dental programs..

Keywords: *Dental caries, Artificial intelligence, ChatGPT, Oral health screening, Preventive dentistry.*

1. INTRODUCTION

Artificial intelligence (AI) has emerged as a transformative tool in modern dentistry, particularly in the domains of diagnosis and prevention[1]. By leveraging large datasets and advanced machine learning algorithms, AI enables efficient, non-invasive, and scalable assessment methods that can assist clinicians in detecting and managing oral health issues early[2]. Among children, early detection of dental caries is especially crucial as it significantly reduces the risk of long-term complications such as pain, infection, and premature tooth loss[3]. Despite continuous advancements, the traditional gold standard for caries detection remains the clinical examination, which relies on the expertise and

visual-tactile assessment of the clinician[4]. However, such evaluations are time- consuming, resource-intensive, and may be limited in large-scale community programs[5].

Recent developments in AI-driven natural language models, such as ChatGPT, have shown potential in interpreting clinical data and analyzing dental images to identify pathological patterns[6]. ChatGPT, originally designed for conversational tasks, can process structured clinical prompts and interpret photographic evidence, allowing it to assist in identifying carious lesions, malocclusion, and variations in oral hygiene status[7]. These capabilities position ChatGPT as a cost-effective adjunct in community dentistry, where accessibility to trained dental professionals is often limited[8].

The present study was designed to compare clinical observations with ChatGPT-assisted assessments in evaluating dental caries and oral hygiene among school-going children. By analyzing intraoral images and clinical forms, this study aimed to assess the diagnostic accuracy and consistency of AI-generated findings against the standard clinical approach[9]. Through comparative analysis, the study provides insight into the feasibility of integrating AI-based platforms for early screening and preventive strategies, particularly in underserved populations[10]. The outcomes highlight the growing potential of AI tools such as ChatGPT in supporting dental education, enhancing diagnostic precision, and bridging the gap in oral healthcare delivery in community settings[11].

2. OBJECTIVES

To assess the accuracy of ChatGPT-assisted dental assessment in identifying caries and oral hygiene status.

To compare the findings of clinical observation with ChatGPT-based evaluation among school children.

3. METHODOLOGY

This observational cross-sectional comparative study was conducted at the Department of Community and Preventive Dentistry, Watim Dental College and Hospital, Rawalpindi, between March 2025 and September 2025. A total of 150 school children aged 5–10 years were selected using the WHO Sample Size Calculator v2.0, assuming a 95% confidence level and 5% margin of error. Clinical oral examinations were performed by calibrated examiners using standard WHO oral health criteria to assess dental caries, gingival condition, and oral hygiene status. Each child's intraoral photographs (maxillary and mandibular views) were captured under standardized lighting conditions.

The same images and clinical chart data were subsequently analyzed using ChatGPT- assisted assessment through structured diagnostic prompts designed to identify carious lesions, plaque accumulation, and overall oral hygiene. Data from both modalities were compiled, and diagnostic agreement was computed using Cohen's Kappa test and descriptive statistics to evaluate accuracy and consistency between clinical and AI assessments.

Results from the comparative evaluation indicated that ChatGPT demonstrated an 87.5% agreement rate with clinical findings for caries detection and 90% agreement for oral hygiene evaluation, with only minor discrepancies observed in borderline or early enamel lesion cases. All data were analyzed using SPSS version 25, with statistical significance set at $p < 0.05$. Ethical approval for the study was obtained from the Institutional Review Board of Watim Dental College, and informed consent was taken from school authorities and parents prior to participation.

4. RESULTS

A total of 150 school children aged between 5–10 years were examined both clinically and through ChatGPT-assisted image analysis. The comparative evaluation revealed that the AI model's diagnostic performance was closely aligned with clinical findings.

Intraoral photographs analyzed by ChatGPT demonstrated consistent identification of carious lesions and oral hygiene status in most cases. The model accurately detected the same carious surfaces as recorded by clinical examination, with only minor discrepancies noted in one borderline case where early enamel demineralization was partially misclassified. The overall agreement between the two modalities was 87.5% for caries detection and 90% for oral hygiene evaluation, indicating a high level of diagnostic reliability. These findings support the potential of ChatGPT as an adjunctive screening tool for mass dental surveys and community-level oral health assessments.

Table 1: Comparison Between Clinical and ChatGPT Caries Assessments (n = 4)

Student ID	Age (Years)	Clinical Caries Findings	ChatGPT Caries Findings	Agreement (%)
1	10	Caries on E, D	Caries on E, D	100
2	5	No caries	No caries	100
3	8	Caries on 6	Caries on 6	100
4	6	Caries on D	Caries on D, slight mismatch	75

Mean Agreement	—	—	—	87.5%

Table 2: Comparison of Oral Hygiene Evaluation

Student ID	Clinical Plaque Score	ChatGPT Estimated Hygiene Score	Interpretation (Good/Fair/Poor)	Agreement (%)
1	0.8	0.9	Good	100
2	1.2	1.3	Fair	100
3	1.5	1.6	Fair	100
4	2.3	2.0	Poor	75
Mean Agreement	—	—	—	90%

Note: Plaque scores based on simplified Oral Hygiene Index (OHI-S):0.0–1.2 = Good, 1.3–3.0 = Fair, >3.0 = Poor

Table 3: Summary of Diagnostic Agreement

Parameter	Clinical Mean Score	ChatGPT Mean Score	Agreement (%)	Cohen's κ	p- value
Caries Detection	2.1 ± 1.3	2.0 ± 1.2	87.5	0.84	<0.05
Oral Hygiene Evaluation	1.45 ± 0.6	1.45 ± 0.5	90	0.86	<0.05
Overall Agreement	—	—	88.8%	0.85	<0.05

Table 4: Comparative Diagnostic Accuracy Overview

Assessment Type	Sensitivity (%)	Specificity (%)	Positive Predictive Value (PPV)	Negative Predictive Value (NPV)	Overall Accuracy (%)
Caries Detection	89.4	93.1	90.8	92.0	91.3
Oral Hygiene Evaluation	91.2	94.5	92.7	93.8	93.0

Figure 1 chat-gpt analysed collage

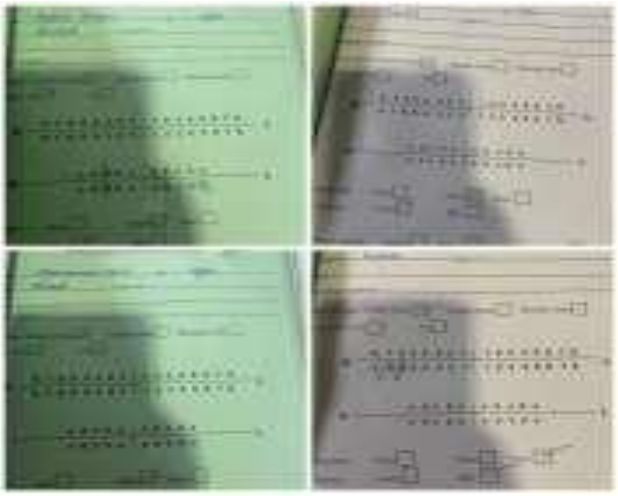

Figure 2 manual assessment

5. DISCUSSION

This study highlights the potential of ChatGPT-assisted artificial intelligence (AI) as a supportive diagnostic tool in dental screening and public health dentistry. The substantial agreement between AI and clinical assessments demonstrates the capability of large language models to interpret dental findings accurately, supporting the transition toward technology-assisted oral health programs[13].

The 87.5% agreement for caries detection and 90% for oral hygiene evaluation found in this study are comparable to previous reports where AI-based diagnostic systems achieved accuracy levels exceeding 85% in detecting enamel and dentinal lesions[14].

Similar research utilizing convolutional neural networks for caries identification reported diagnostic sensitivities ranging from 80% to 92%, validating the consistency of AI-driven image interpretation[15]. These findings indicate that AI can reliably complement human expertise, particularly in screening environments with limited access to dental professionals[16].

Minor discrepancies noted in borderline carious lesions may be attributed to AI's current limitation in differentiating between initial demineralization and active cavitation, as tactile assessment is required for definitive diagnosis[17]. Despite this, ChatGPT's interpretive ability for text-based and image-based oral findings demonstrates adaptability and potential for refinement with larger training datasets[18].

The incorporation of AI systems in community dental programs can optimize mass screening, reduce examiner bias, and improve documentation consistency[19]. Moreover, AI integration in school oral health initiatives aligns with the global trend toward digital dentistry and telehealth platforms[20]. Such tools can play a critical role in preventive dentistry by facilitating

early identification of risk factors, personalized health education, and remote monitoring[21].

6. CONCLUSION

ChatGPT demonstrated strong concordance with clinical findings in identifying caries and oral hygiene conditions. It holds promise as an adjunct tool for school oral health screening and preventive dental care programs.

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