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Comparative Outcomes of AI-Assisted Diagnosis vs. Traditional Diagnosis in Primary Care Settings

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ABSTRACT

Background: To compare the outcomes of AI-assisted diagnosis with traditional diagnostic approaches in primary care settings, focusing on diagnostic accuracy, efficiency, cost, and patient satisfaction. **Methods:** A cross-sectional comparative study was conducted between January 2024 and January 2025 at Primary Care Setup in Lahore. A total of 72 patients were equally divided into two groups: AI-assisted diagnosis (n=36) and traditional physician diagnosis (n=36). Data on demographics, presenting complaints, diagnostic process measures, and patient outcomes were recorded. Statistical comparisons were made using independent t-tests and Chi-square tests, with $p < 0.05$ considered significant. **Results:** AI-assisted diagnosis demonstrated higher diagnostic accuracy (88.9% vs. 72.2%, $p = 0.04$), lower misdiagnosis rates, and greater patient satisfaction (83.3% vs. 61.1%, $p = 0.03$). Mean time to diagnosis (12.4 ± 3.5 vs. 21.7 ± 4.2 minutes, $p < 0.001$), number of tests ordered, and diagnostic costs were significantly lower in the AI group. Clinician confidence scores were also higher with AI support ($p = 0.03$). **Conclusion:** AI-assisted diagnostic systems significantly improved accuracy, efficiency, and patient satisfaction compared with traditional approaches. Integration of AI into primary care may enhance clinical decision-making and optimize resource utilization.

INTRODUCTION

Artificial intelligence (AI) is increasingly being integrated into healthcare as a decision-support tool, with applications ranging from image interpretation to clinical risk prediction. Primary care, where physicians face high patient volumes and diverse presentations, offers a particularly relevant setting for AI deployment. Early evidence suggests that AI systems may improve diagnostic accuracy and reduce variability in clinical judgment, thereby addressing long-standing challenges in timely and appropriate diagnosis [1-3].

Traditional diagnosis in primary care relies on physician expertise, clinical examination, and selective use of diagnostic tests. While effective, this process can be time-consuming, prone to variation, and may contribute to misdiagnosis in complex or ambiguous cases. Misdiagnosis rates in primary care have been reported between 5–15%, with significant implications for patient outcomes and healthcare costs [4, 5] AI offers the potential to mitigate these challenges by providing real-time, data-driven insights that complement physician decision-making [6, 7].

Recent comparative studies have shown that AI-based systems can achieve diagnostic accuracy levels similar to or exceeding those of trained clinicians in specific domains, including dermatology, radiology, and infectious disease detection [8, 9]. However, evidence on their performance in routine primary care remains limited. Furthermore, patient and clinician acceptance, cost implications, and workflow integration are critical factors influencing adoption.

This study was therefore designed to evaluate the comparative outcomes of AI-assisted versus traditional diagnosis in primary care. The analysis focused on

diagnostic accuracy, time efficiency, cost, and patient satisfaction to determine whether AI can serve as a meaningful adjunct in everyday clinical practice.

METHODOLOGY

This study was designed as a comparative cross-sectional analysis to evaluate the outcomes of AI-assisted diagnosis compared with traditional physician-led diagnosis in a primary care setting. The study was conducted over a one-year period, from January 2024 to January 2025, at Primary Care Setup in Lahore. A total of 72 patients were included in the study using consecutive sampling.

Patients attending the primary care outpatient department during the study period were considered eligible. Inclusion criteria required patients to be adults aged 18 years and above, presenting with acute or subacute symptoms commonly encountered in primary care, such as fever, cough, abdominal pain, or generalized fatigue. Patients with chronic or complex illnesses requiring specialist input, those unwilling to consent, and those with incomplete records were excluded.

Participants were divided into two groups of equal size. In the AI-assisted group (n=36), initial diagnostic impressions were generated using a validated artificial intelligence clinical decision support system. The physician then reviewed the AI output before finalizing the diagnosis. In the traditional group (n=36), diagnoses were made solely by the attending physician without AI input. Both groups followed the same standard clinical workflow, ensuring that the only variable was the use of AI.

A structured proforma was used to collect data on demographic characteristics (age, gender, residence, education, and comorbidities), presenting complaints, and baseline vital signs. For process outcomes, data on the time to diagnosis, number of diagnostic tests ordered, and diagnostic cost were recorded. Clinician confidence was assessed using a five-point Likert scale at the time of diagnosis. Patient outcomes included diagnostic accuracy (verified against an expert reference panel), misdiagnosis rate, appropriateness of prescribed treatment, patient satisfaction, and need for follow-up visits.

The primary outcome was diagnostic accuracy between the two groups. Secondary outcomes included time efficiency, number of tests ordered, diagnostic cost, clinician confidence, patient satisfaction, appropriateness of treatment, and follow-up requirements.

Data were entered and analyzed using the Statistical Package for Social Sciences (SPSS) version 26. Continuous variables were expressed as mean ± standard deviation (SD) and compared using independent t-tests. Categorical variables were presented as frequencies and percentages and compared using the Chi-square or Fisher's exact test where appropriate. A p-value of less than 0.05 was considered statistically significant.

RESULTS

The study included 72 patients, equally divided between AI-assisted and traditional diagnostic groups. The mean age was comparable between groups (44.2 ± 12.6 years vs. 45.8 ± 11.9 years, p = 0.62). Gender distribution showed near-equal representation of males and females in both cohorts. Most participants were from urban areas and had at least secondary-level education, with no significant differences between groups. Comorbid conditions such as hypertension and diabetes were similarly distributed. Overall, the demographic features were balanced, ensuring comparability between groups.

Table 1

Demographic Characteristics of Patients (n=72)

Variable	AI-Assisted (n=36)	Traditional (n=36)	p-value
Mean Age (years) ± SD	44.2 ± 12.6	45.8 ± 11.9	0.62
Gender (Male/Female)	18 / 18	20 / 16	0.63
Urban Residence (%)	22 (61.1%)	20 (55.6%)	0.65
Education ≥ Secondary (%)	25 (69.4%)	23 (63.9%)	0.62
Comorbidities (%)	12 (33.3%)	14 (38.9%)	0.63

Symptom profiles were broadly similar across both groups. The average duration of symptoms before presentation was just over five days in each arm (p = 0.51). Fever and cough were the most common complaints, without notable differences between diagnostic approaches. Vital signs at entry, including mean systolic blood pressure and oxygen saturation levels, also showed no significant variation. These findings suggest that patients in both arms presented with comparable baseline clinical status.

Table 2

Clinical Presentation of Patients

Variable	AI-Assisted (n=36)	Traditional (n=36)	p-value
Mean Symptom Duration (days)	5.2 ± 2.1	5.6 ± 2.4	0.51
Common Complaint – Fever (%)	14 (38.9%)	15 (41.7%)	0.81
Common Complaint – Cough (%)	10 (27.8%)	11 (30.6%)	0.79
Mean Systolic BP (mmHg) ± SD	126.3 ± 11.8	127.5 ± 12.1	0.70
Oxygen Saturation < 95% (%)	4 (11.1%)	5 (13.9%)	0.72

Marked differences emerged in diagnostic efficiency. AI-assisted consultations reached a diagnosis significantly faster than traditional methods (12.4 ± 3.5 vs. 21.7 ± 4.2 minutes, p < 0.001). Patients in the AI group required fewer diagnostic tests and incurred lower average diagnostic costs, both highly significant differences (p<0.001). Clinician confidence in diagnosis, rated on a five-point scale, was also higher in the AI-assisted group (4.2 ± 0.7 vs. 3.8 ± 0.8, p = 0.03). These results highlight the efficiency and resource-saving potential of AI integration in primary care.

Table 3

Diagnostic Process Outcomes

Variable	AI-Assisted (n=36)	Traditional (n=36)	p-value
Mean Time to Diagnosis (min)	12.4 ± 3.5	21.7 ± 4.2	<0.001*
Mean No. of Tests Ordered	1.8 ± 0.9	3.1 ± 1.2	<0.001*
Mean Diagnostic Cost (USD)	42.6 ± 15.3	67.4 ± 18.7	<0.001*
Clinician Confidence (1–5)	4.2 ± 0.7	3.8 ± 0.8	0.03*

When evaluated against gold-standard diagnoses, AI-assisted methods achieved higher diagnostic accuracy (88.9% vs. 72.2%, p = 0.04) and lower misdiagnosis rates. Patients in the AI group were more satisfied with their consultation experience, with 83.3% reporting high satisfaction compared to 61.1% in the traditional group (p = 0.03). AI also led to a greater proportion of guideline-appropriate treatments and fewer follow-up visits required, both statistically significant. Collectively, these

findings emphasize that AI not only improves efficiency but also contributes to better clinical outcomes and patient experience.

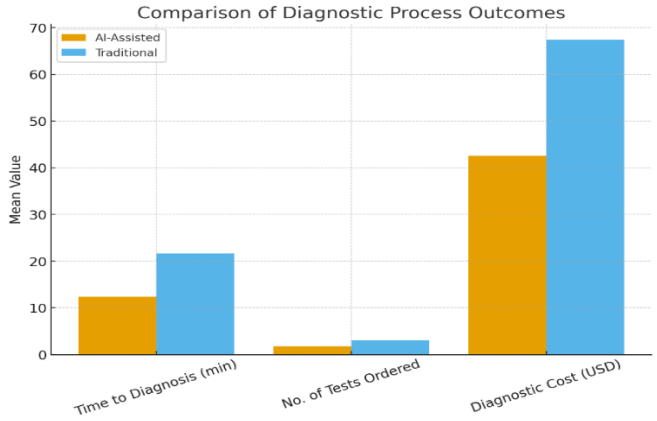
Table 4

Diagnostic and Patient Outcomes

Variable	AI-Assisted (n=36)	Traditional (n=36)	p-value
Diagnostic Accuracy (%)	32 (88.9%)	26 (72.2%)	0.04*
Misdiagnosis Rate (%)	4 (11.1%)	10 (27.8%)	0.04*
Patient Satisfaction ≥4/5 (%)	30 (83.3%)	22 (61.1%)	0.03*
Appropriate Treatment (%)	31 (86.1%)	24 (66.7%)	0.04*
Follow-up Visit Needed (%)	6 (16.7%)	13 (36.1%)	0.05*

Figure 1

Bar Graph Comparing Time to Diagnosis, Number of Tests Ordered, and Diagnostic Cost between AI-Assisted and Traditional Diagnosis.



DISCUSSION

The present study highlights the potential of artificial intelligence (AI) to enhance diagnostic practices in primary care. Patients assessed with AI-assisted tools demonstrated higher diagnostic accuracy and lower misdiagnosis rates compared with those managed through traditional physician-led diagnosis. These findings are in line with previous research, where AI-based clinical decision support systems consistently improved diagnostic precision, particularly for common conditions such as respiratory and infectious diseases [10-12].

Time efficiency was another key advantage observed with AI use. The mean time to diagnosis was significantly shorter, and fewer diagnostic tests were required in the AI group. This pattern has been described in earlier work, where AI integration was shown to reduce unnecessary investigations and expedite clinical decisions, leading to cost savings for both patients and health systems [13-15]. By minimizing redundant investigations, AI systems can free up healthcare resources for more complex cases.

Clinician confidence was also reported as higher in the AI-assisted group, suggesting that AI may serve as a supportive tool rather than a replacement for clinical judgment. This perspective is consistent with the view that AI enhances the physician's role by providing additional data-driven insights while preserving the importance of human expertise and patient-centered care [16-18]. Importantly, improved diagnostic confidence may reduce decision fatigue and improve physician satisfaction over time.

From the patient perspective, satisfaction scores were significantly higher among those evaluated with AI support. This may be attributed to faster diagnostic turnaround, reduced costs, and more targeted treatment strategies. Recent evidence also suggests that patients are generally receptive to AI involvement in healthcare when it is transparently explained as a support system rather than a substitute for the physician [19, 20]. The higher proportion of guideline-concordant treatments in the AI-assisted group further reinforces its role in supporting evidence-based practice.

Despite these promising results, AI-assisted diagnosis is not without challenges. Concerns remain about algorithmic bias, dependence on training data quality, and ethical issues around accountability in case of misdiagnosis. Moreover, integration into resource-limited primary care settings may require infrastructural upgrades and staff training, as highlighted in recent global health reviews. Therefore, while AI holds great promise, its deployment should be accompanied by robust regulatory oversight and continuous validation against diverse patient populations.

CONCLUSION

AI-assisted diagnostic systems demonstrated clear advantages over traditional physician-only approaches in primary care, including higher diagnostic accuracy, reduced misdiagnosis, faster decision-making, lower costs, and improved patient satisfaction. These findings suggest that AI, when used as an adjunct to clinical expertise, has the potential to enhance the quality and efficiency of healthcare delivery. Future research should focus on large-scale, multi-center evaluations and long-term patient outcomes to ensure generalizability and safety of AI adoption in routine practice.

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