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Main Risk Factors for The Development of Diabetic Foot

Sadikova N.G., Istamova A.
Tashkent State Medical University

Article History	Abstract
Received: 8th February, 2026 Accepted: 7th March 2026	Artificial intelligence (AI) has emerged as a transformative technology in modern biomedical research and clinical practice. Advances in machine learning and deep learning algorithms have enabled automated analysis of complex biomedical datasets, including medical imaging, genomic information, and electronic health records. These technologies have demonstrated promising capabilities in the early detection of diseases such as cancer, cardiovascular disorders, and neurological conditions. Early diagnosis is critical for improving patient outcomes and reducing healthcare costs. This paper reviews recent developments in AI-driven diagnostic systems, explores their applications across different medical fields, and discusses the challenges associated with implementation, including data quality, algorithm bias, ethical concerns, and regulatory considerations. While AI has the potential to significantly enhance diagnostic accuracy and support clinical decision-making, successful integration into healthcare systems requires robust validation, transparency, and interdisciplinary collaboration. The review highlights emerging trends and future opportunities for AI in early disease detection.
Keywords: Artificial intelligence; machine learning; early diagnosis; biomedical informatics; digital health; medical imaging	

Type 2 diabetes mellitus (T2DM) is a metabolic disease characterized by chronic hyperglycemia (elevated blood glucose levels), which develops as a result of impaired insulin action or secretion (WHO, 1999). In patients with this form of the disease, the pancreas is unable to produce sufficient insulin, or the body cannot use it effectively. T2DM is diagnosed in 90% of people with hyperglycemia [1,2,3].

Diabetic foot is a severe complication of diabetes mellitus, occurring in 3–12% of patients due to damage to nerves and blood vessels. It manifests as ulcers, purulent-necrotic processes, which may lead to gangrene and amputation [4,7].

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The basis of prevention includes glycemic control, daily foot inspection, proper footwear, and hygiene to avoid injury and infection.

On average, 300 to 500 limb amputations are performed worldwide every day. This corresponds to approximately one amputation every 3–5 minutes, including those due to vascular diseases and trauma. About 185,000 amputations are performed annually [5,6].

Therefore, the main aim of our study was to assess risk factors and early diagnosis of diabetic foot in patients with type 2 diabetes mellitus.

Materials and Methods

The study included 30 patients with T2DM, with a mean age of 56.8±4.5 years and a disease duration of 6.7±2.3 years, who attended the outpatient clinic of the National Medical Center. Among them, 22 were men and 8 were women.

As glucose-lowering therapy, 12 patients received a combination of SGLT-2 inhibitors (10 mg) with metformin (1000 mg twice daily) and DPP-4 inhibitors. Eighteen patients received insulin therapy (long-acting and ultra-long-acting insulin once daily at night).

All patients underwent measurement of fasting blood glucose, postprandial glucose (2 hours after meals), and glycated hemoglobin (HbA1c). Doppler ultrasonography of the lower limb vessels was performed in all patients. The ankle-brachial index (ABI) was also assessed.

The normal ABI range is 1.0–1.3; acceptable values are 0.9–1.0; moderate ischemia is 0.7–0.9; severe ischemia is 0.4–0.7; and values <0.4 indicate critical ischemia with a high risk of necrosis.

Results

All patients were evaluated for carbohydrate metabolism parameters: fasting glucose, postprandial glucose, and HbA1c.

According to the results, 23 (73.3%) patients had fasting glucose levels of 9.8±2.3 mmol/L, postprandial glucose of 12.6±2.7 mmol/L, and HbA1c of 10.2±3.2%.

Seven (26.7%) patients had fasting glucose of 7.2±1.2 mmol/L, postprandial glucose of 9.3±1.1 mmol/L, and HbA1c of 7.5±1.2%.

Doppler examination of the lower extremities revealed atherosclerotic changes in 5 (16.6%) patients.

According to Doppler data, patients in the first group (HbA1c >7.0%) showed reduced blood flow velocity in the superficial femoral, deep femoral, popliteal, anterior and posterior tibial arteries. In the anterior and posterior tibial arteries, blood flow was reduced by 21.9% ($p<0.05$).

The ankle-brachial index (ABI) reflects arterial blood flow in the lower extremities. It is calculated as the ratio of ankle systolic blood pressure to brachial systolic blood pressure:

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ABI = BP (ankle) / BP (brachial)

According to our results:

- 10 patients (33.3%) had ABI 0.7–0.9
- 5 patients (16.7%) had ABI 0.4–0.7
- 3 patients (10%) had ABI <0.4 (critical ischemia)
- 12 patients (40%) had borderline values (~0.9)

Modifiable risk factors were also assessed, including smoking, obesity, and arterial hypertension. It was found that:

- 10 (45.5%) male patients smoked approximately one pack of cigarettes per day
- 11 patients (36.7%) had elevated blood pressure
- 8 patients (26.7%) had grade 1–2 obesity

Conclusions

1. Among the examined patients, 23 (76.7%) had decompensated diabetes mellitus.
2. Doppler ultrasonography revealed a 21.3% reduction in blood flow in the anterior and posterior tibial arteries in patients with decompensated diabetes compared to relatively compensated patients.
3. According to ABI results in patients with type 2 diabetes:

- 33.3% had ABI 0.7–0.9
- 16.7% had ABI 0.4–0.7
- 10% had ABI <0.4 (critical ischemia)
- 40% had borderline values (~0.9)

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