

Nanosensors for early detection of diabetic foot ulcer

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Diabetes has now become a very common disease. In this condition, the glucose level in the blood is high all the time. The reason is either the beta cells present in the islets of Langerhans in the pancreas could not produce insulin or the receptor failed to recognise insulin. This causes several problems. Only when insulin binds to the receptor, cells can uptake glucose and produce energy. If the glucose stays in the blood for a longer period, it will start accumulating around the blood vessels and nerves. This will severely damage the blood vessels which will, in turn, hinder the blood supply to the particular area. As it also affects the nerves, the person with diabetes will not be able to feel the pain. The highly prone area is the feet. It has been estimated that nearly one-tenth of the people with diabetes have a high chance of developing foot ulcers. If the ulcers are not detected at very early stages, then it would be difficult to treat later on. If the condition worsens the only option available is going for an amputation. In case of ulcers developing on the foot, the blood supply will be lesser, leading to reduced temperature in the affected area. Therefore, temperature sensors can be used to check the temperature. However, there is still a need for a device that has higher efficiency and reliability with a measurable output. Additionally, it should also have user-friendly characteristics. Hence, nanosensors can be used as they possess high efficiency and sensitivity. These nanosensors are capable of detecting small temperature changes more effectively. They can be connected to Arduino which is programmed in such a way that takes in 10 values of the temperature of the foot as an input, takes an average and compares it with the standard or the normal temperature. If the temperature difference is more than 2-3 degrees Celsius, then it will display as 'Risk' on the output screen of the display device. This is a device that is easy to use when the user does not want to do any calculations. The foot can be placed on the sensor device and then the output can be read. It can be done for both feet as well. Instead of using conventional sensors to detect temperature, which only shows temperature readings, this simple device can be used to detect foot ulcers at very early stages.

Keywords: Diabetes, Foot Ulcer, Nanosensors, Temperature, Monitoring

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