Developing an Automated Effective Device Using Turbidity-based Technique for Identifying Sickle Cell Anemia

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Sickle cell anemia (SCA) is defined as an inherited blood disorder characterized by the presence of hemoglobin S (Hb-S) that damages and deforms red blood cells. It is estimated that each year over 300,000 babies with SCA are born worldwide. Diagnosis of this disease is effectively dependent on hemoglobin electrophoresis in some specialized hospitals. However, the blood tests using this technique are very expensive and time consuming. Other non-specialized hospitals and primary health care centers use blood tests based on turbidity, which are performed manually with less accuracy. The purpose of this study was to develop an effective automated turbidity-based device for detecting SCA that provides accurate diagnosis in an affordable and easy way. The device is based on detecting the turbidity of blood sample by measuring the absorbance rate using a laser and light sensor in the device. Using this device, 70 normal and 70 SCA affected blood samples were tested and results were compared to those obtained by hemoglobin electrophoresis and the manually performed turbidity tests and were consistent. The device exhibits accuracy, time and cost efficiency in comparison to the other SCA identifying tests. The study also demonstrated the feasibility of this device to detect other disorders dependent on blood turbidity.

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