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Lipid Data Acquisition for devices Treatment of Coronary Diseases Health stuff on the Internet of Medical Things

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Abstract- Recently, the widespread deployment of smart phones globally, biomedical diagnostics. Smartphone-based devices are expected to be commonly used Intelligent Health Tracking Point-of-Care (PoC) Internet of Medical Things (IoMT) applications. As a result, this paper presents a smartphone-based blood lipid data acquisition dongle for measuring blood lipid levels such as TC, HDL-C, and triglycerides (TG). Blood loss in the fingertip to manage coronary artery disease. A thin photochemical during detection. The test strip, composed of LEDs and detectors, is plugged into a small dongle where the colour switches. The intensities of the calculated reflective coefficient of the lipide determinant are indicated. The product of chromogenics. Such photochemical data acquisition data dongle was focused on smart phones. Validated and achieved a correlation coefficient above 0.843 by reference to a clinical analyzer and summed. 5.017 per unit variance coefficient (CV) for 93 blood lipid patients assessment. The photochemistry Therefore, dongle is promising for the potential treatment of IoMT chronic diseases.

Keywords- Blood lipid, photochemical, dongle, smart phone, Internet of Medical Things.

1. INTRODUCTION

Based on World Health Organization's data (WHO), Cardiovascular diseases (CVD), causing 18.1 million deaths every day, are the world's leading cause of death. More than 80.5% of them take place in low-income areas and in developed countries [1], the year after year. The artery deposit is raised, further blocks the artery and causes atherosclerosis with a high level of cholesterol This means that blood lipid/lipoprotein level surveys, total cholesterol (TC), triglycerides (GT) and cholesterol with a low-density lipoprotein (LDL-C) and lipoprotein with a high density cholesterol are regularly needed (one form of CVD). Routine testing is required(HDL-C). [2] Effective cholesterol testing at the point of



care (POC) is also highly efficient. [3-4]

Among the standard HDL-C measurement methods and in clinics, the LDL-C is one option normally used Calculation of the Friedewald formula [6]. However, this is an approach limited by high sample waste and low Limited Problems with accuracy. More straightforward and realistic blood Acquisition of lipid data approaches to reduce the sample it is extremely desirable to ship and test time.

POC testing typically involves a small amount of blood. In particular, the results are not possible from the fingertip. Long after inspection, which is extraordinarily Beneficial Hypercholesterolemia auto-administration. Tests in a hospital that restrict the number of patients should not be carried out. Time and shipping impacts of turnaround. A number of POCT biomedical diagnostic frameworks have been developed in recent years Suggested [7]–[17]. For specialist and consumer cholesterol measurements a variety of POCT instruments are available. [18], [19]. Cardiocheck PA, for example, senses the HDL performance based on the spectro photometric strategy to be used Mark the reflected light's colour change off an expendable. After the blood test, test strip.

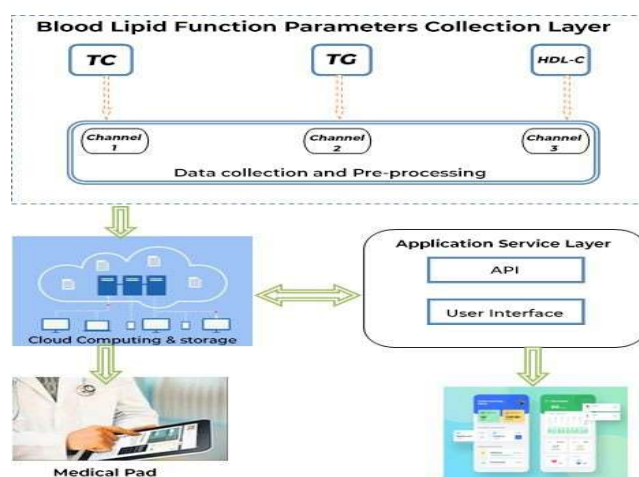


Figure 1. Blood lipid management architecture with IMOT.

As another case, enzymatic treatment with Cholestech LDX consolidates Software for solid stage quantification for TC, TG, HDL-C, and Serum glucose, urine, blood glucose. However, it remains in general and a few LDL-C electrochemical biosensors and calculating HDL-C.

We deliver smartphone-based services with certain benefits. Approach to track blood lipid levels through means of a photochemical lipid data acquisition process only using fingertips. Treatment of cardiovascular POC disease. For the power supply and data the dongle is conveniently attached to smartphone On-the-Go (OTG) cable transmission USB.

The trial Conducts a small and compact plug into the dungeon Photochemical trial strip disposable on which the study is blood. He's fallen first. Then the colour intensities calculated indicate the chromomeric product reflection coefficient Should reveal evidence for blood lipids for TC, TG, And HDL-C. A decent bargain has been achieved by contrast For an analyzer clinical. Such a smartphone-based approach The acquisition of blood lipid data is exciting for the future Treatment of chronic IoMT diseases.

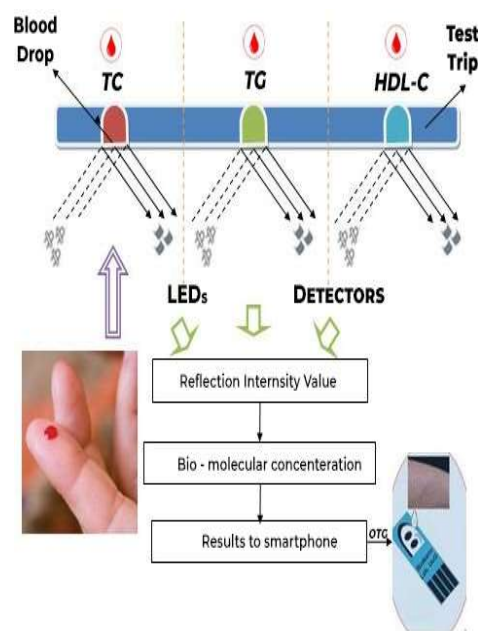


Figure 2. Figure of the proposed photochemical data analysis and test strip on the Smartphone.

2. PROCEDURE

The suggested photochemical lipid based on smart phones. The data collection datastrip dongle with the accompanying IoMT blood lipid control architecture is shown. In the Fig. 1. There are three LEDs in the dongle. TC, TG and HDL-C in three channels, Sense Each of them. The LEDs will illuminate the chemical sensing field for the first time. Some reactions are accompanied by the related chemical substance, blood sample is lowered. The reflection of light will be created to alter.

Established changes in the values at the measured reflection strength. Detector, the criteria of bimolecular concentration are received and moved further to the mobile the cable OTG. The blood lipid can be called this component IoMT architecture feature parameter set sheet.

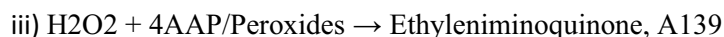
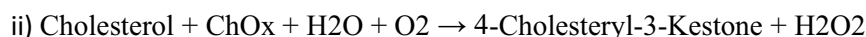
The data is eventually submitted for massive data to the cloud Storage and computation. You will also use the cloud data patients and clinicians at their respective smart terminals Management of CVD.

A. DETECTING MECHANISM PLASMA LIPID

1. MECHANISM TC DETECTING

The mechanism to achieve in our photochemical dog the following was the enzymatic meaning of TC in blood. In the beginning, Blood cholesterol ester has been catalyzed free cholesterol and fatty acid esterase.

Then cholesterol oxidize catalysis is the product free cholesterol in 4-Cholesteryl-3 was oxidized further H₂O₂ and Keystone. The generated H₂O₂ would then be reacting to chromogenicity with the chromomeric agent Product which would contribute to multiple reflection coefficients at its concentration. The strength of the calculated changes therefore Can display concentration of TC.



2. FUNCTION OF HDL-C SENSING

With HDL-C, it cannot be measured directly as there is a significant intersection of proteins with lipids. So we used a standardized test to screen the Non-HDL synthetic and polyanion lipoproteins. Then, the enzymatic effect of HDL cholesterol HDL-C blood characterization of cholesterol oxidase.

The Face Below is an example of the operating process of the HDL-C sensor.

- i) $\text{Non-HDLs} + \alpha\text{-cyclodextrin} + \text{MgCl} \rightarrow \text{Soluble Complexes of Non-HDLs}$
- ii) $\text{HDL-C} + \text{PEG modified ChEs and ChOx} \rightarrow \text{Cholestenone} + \text{Fatty Acid} + \text{H}_2\text{O}_2$
- iii) $\text{H}_2\text{O}_2 + 4\text{AAP/Peroxidase} \rightarrow \text{Ethyleniminoquinone, A-139}$

B. CHEMICAL PROCESSING

From the study of the aforementioned working theory, a miniaturized optoelectronic calculation of the reflected light intensity on TC, TG, and HDL-C channel is needed circuit inside the device that transforms the light to optoelectronic current and then suits the biosample the emphasis. The focus. As seen in the figure in the block scheme. 2, the Dongle uses a microcontroller STM32 composed of Different functional blocks like core ARM, ADC, and memory, And I/O, monitoring total internal loops and rereading. LED drivers and opto-detectors are other subsystems, Control block for temperature, power, OTG, USB contact and Communication.

The effects are calculated photo chemically is finally transferred via the OTG USB to a Smartphone Cable seen and seen. You can also upload the data on your computer. IoMT health services cloud server. The image and detailed schematic diagram photochemical Smartphone dung with computer. In the Fig is illustrated test strip. Three, Fig in which. 3 screens Fig and dongle. The photochemical test strip is seen in 3(b).

The Face It was designed with a screwdriver (Sim-101, Test strip). A spottering machine (Sim-001) and Bioline Laboratory. This is the simple industrial flow. The strip substratum joins the dotter at first Enzyme point (Sim-101, Bioline Laboratory, India) $25 \pm 2^\circ\text{C}$ temperatures and between 15% - 20% humidity.

The strip is then dried up at 37°C in a tunnel stove (Sim-201, Bioline Laboratory, India). Then, a cutting machine (Sim-301, Bioline Laboratory, India) is used to split the strand substratum into single test strips, then stacked with an enzyme board, a diagnostic membrane regulated by diffusion, an entire blood separation membrane and a blood diffuse membrane. Layer (b1) in photo. 2 is used to patch the chromomeric agent previously dropped at the three channels workplace. The coating was then baked at 38°C in a drying box for around 1.5 hour (Dry-401, Bioline Laboratory, India).

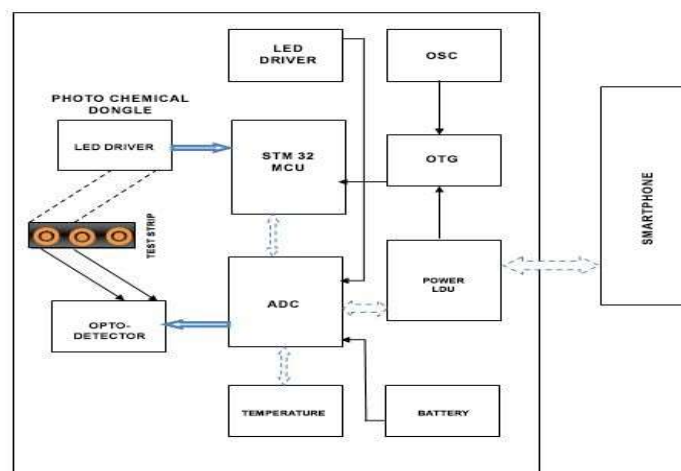


Figure 3. Photochemical dongle with test strip functional block diagram.

As Fig reveals. 2(d), the sensing block for temperature can support to maintain purely biological temperature conditions experience. The calculation of photochemical reactions and consistent results can also be correct. The photochemical dongles are connected with the OTG cable to the Smartphone and the sensed data is sent directly to the power source in real time.

3. DISCUSSION AND RESULT

Photochemical blood performance of the suggested IoMT a distinction was made of the lipid data acquisition dongle Hitachi Biochemical Analyzer 5260 with a commercial tool. To prepare a report, we have prepared 78 samples for the procedure in 78 patients with fingertips and venous blood. For comparison research, the fingertip blood obtained by the disposable needles was. Professionals use two amounts of their hands when there is little oxygen while extracting blood. Note when patients have undergone different medication for swelling, paronychia or skin disorders.

Our blood lipid calculation (TC, TG, HDL-C) findings and our photochemical recommendation Dongle and the acquisition (LDL-C) results are available for 78 patients. The correspondence curve for our photochemical guidelines In the photo 4. The concentration for the TC study can be shown to be between 0.9405, 0.271 and 0.895 and vary between 2.63 mmol/l and 6.96 mmol/l TG calculation concentration. The coefficient of intercept – 0.08 is 0.94mmol/L at a median length of 4.35 mmol/L and the coefficient of association is 0.9345. For HDL-C measurement, the standard ranges from 1.2 mmol/L to 3.3 mmol/L with a pitch of 0.91, 0.17 intercept and 0.952 coefficient of correlation.

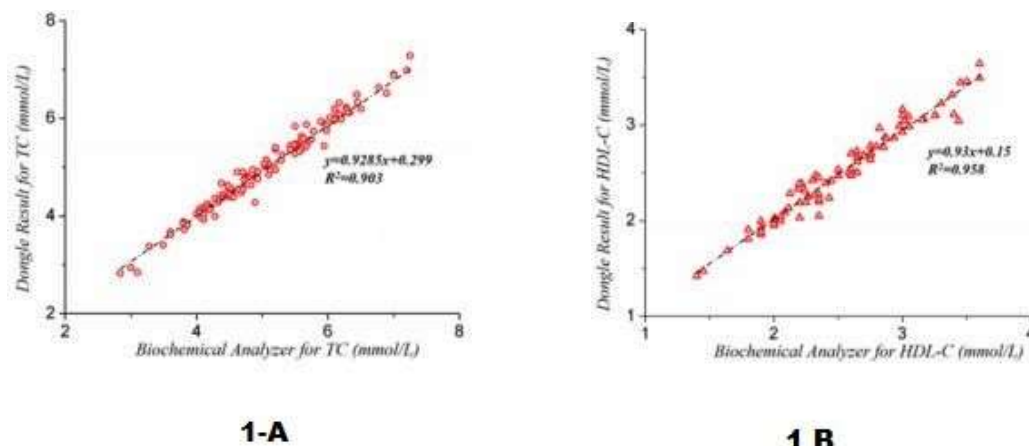


Figure 4. The effects assessed were a) TC levels and (c) HDL-C levels

However, the use of multiple blood samples may contribute to other substances interfering that cause discrepancies Coefficients of reflection and degrade test outcomes of the IoMT blood lipid measuring unit miniaturized. However, it remains within the tolerance range considering such a problem.

Next, high (H), medium (M) and low samples (L) Blood lipid concentration was added to monitor for reliability and repeatability by CV percent of our proposed photochemical dongle (coefficient of variation).

There are the following: For 3 years, repetitive sample experiments have been performed. As illustrated Table 1 indicates an average mean of 4.027% of the cv. Displaying good photochemical dongle efficiency and reproducibility. The photochemical examination of future work further changes should be made in strip layout to limit testing error.

Samples		1 st	2 nd	3 rd	μ	σ	CV%
TC	L	2.38	2.20	2.41	2.34	0.17	4.027
	M	5.18	4.89	4.71	4.92	0.20	3.921
	H	7.72	6.81	7.14	7.05	0.39	5.380
HDL-C	L	1.40	1.43	1.37	1.46	0.05	3.517
	M	2.61	2.40	2.53	2.49	0.10	4.023
	H	3.78	3.24	3.81	3.57	0.21	5.58

Table 1 - Effects of two sample groups with low, medium, and moderate TC and HDL-C concentrations have been measured. The tests were perpetually performed. The CV percent has been measured for 3 times and replicated.

4. CONCLUSION

In view of the present issue of cardiovascular diseases the leading cause of global annual death and its close association it is important to increase the amount of cholesterol diagnosis, POCT diagnosis. Any of them exist methods are based on bulky, insufficient analytical equipment Smart health management focused on IoMT in the future. That is why, it's a promising solution based on the omnipresent mobile. Here we propose to use only a single drop of fingertip blood to collect mobile photochemical data for the POCT blood lipid testing.

With this sort of system, it is possible to get findings from TC, TG, HDL-C, LDL-C. And this dongle can be reached like a clinical biochemical analyzer.

High coefficients of correlation (0.518) and a cumulative average of 3.284 percent CV were demonstrated in POC-blood lipid diagnosis, demonstrating specificity, efficacy and reproducibility. For POC cholesterol diagnostics in the future, thus, the proposed photochemical dongle is very promising. In future work, we expect to reduce the test error further by enhancing the composition of the test strip so the intervening substances in the blood will influence the reflective factor.

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