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Design and Development of Sleep Apnea Detection Device

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Annotation: Patients who already suffer from sleep apnea due to the causes of this disease a lot, where the patient can be helped by monitoring their sleep conditions and the development of the disorder from the normal stages to the dangerous stages to avoid any problems that lead to stopping breathing and the occurrence of apnea and a lack of oxygen, which leads to the death of the person . We have built and designed an electronic model that diagnoses apnea continuously, especially during sleep times, and it will be placed on the patient's chest depending on the measurement of many vital parameters such as chest movement sensor (heartbeat), oxygen saturation by pulse oximeter that is affected by breathing rate, Monitor the patient's temperature and humidity using sensors.

1. Introduction

A sleep disorder is related to a medical disorder that disrupts a person's normal sleep pattern. Some sleep disorders may lead to serious physical, mental, and social health problems for the individual, and may even lead to death if left untreated. Some common types of sleep disorders are sleep apnea, restless leg syndrome, narcolepsy, jet lag, sleepwalking, and sleep paralysis. The usual way to diagnose sleep apnea disorder is polysomnography, which is done in a supervised clinic. It involves complete and continuous monitoring of certain parameters and body functions of the patient. Here in this proposed study, a continuous sleep apnea monitor was developed which can detect spo2, blood pressure, and heart rate in real time. A liquid crystal display is used to show these parameters. The measured physiological parameters can be transferred from the device to the smartphone via Wi-Fi, which can be used for further analysis. Based on experimental results, this wearable device can provide reliable diagnostic results and non-invasive sphygmomanometer has been measured using the cuff-less method. The low-cost device developed can avoid complex procedures and provide continuous monitoring of obstructive sleep apnea.

2. Studies and previous research:

Lack of Accuracy Linda M Street, Carol A Aschenbrenner, TimothT

Houle, Clark W Pinyan, James C Eisenach

Journal of Clinical Sleep Medicine 14(4), 549-555, 2018

Obstructive sleep apnea duringpregnancy: vital signs and postpartum screening models

Objectives of the study:

To measure the prevalence and severity of obstructive sleep apnea in the third trimester and to assess postpartum accuracy. To evaluate a novel biomarker for the detection of obstructive sleep apnea during pregnancy.

Methods:

This observational study was conducted in the obstetrics clinics of Wake Forest School, VA Medication between April 2014 and December 2015. Partial exhaled nitric oxide Measurements and sleep studies were obtained and compared in the gestational and puerperal week. Expired nitric oxide and risk factors for development of apnea in pregnancy for predictive power were assessed independently and in screening models

Results:

Of the 76 women enrolled, 73 had sleep studies valid during pregnancy and 65 had an additional study valid from 6 to 15 weeks postpartum. Twenty-four women (37%) had sleep apnea during pregnancy compared to (35%) women with sleep apnea after childbirth. Eight of the 11 women (73%) were retested at 6 to 8 months Postpartum was persistent sleep apnea

Exhaled nitric oxide had a moderate discrimination assay for obstructive sleep apnea during pregnancy (area under the receiver operating characteristic curve = 0.64). A model using exhaled nitric oxide, pregnancy-specific screening, and the Malampati score improved the ability to identify women at risk of apnea during pregnancy (sensitivity = 46%, specificity = 91%, odds ratio = 5.11%, area under the receiver operating characteristic curve = 0.75).

Conclusions:

Obstructive sleep apnea is common in the early postpartum period and often lasts for at least 6 months. Exhaled nitric oxide as a single screening biomarker for obstructive sleep apnea in pregnancy has only modest distinction. Besides improving the sensitivity and specificity of additional parameters

(1.2.2) Bundit Sawunyavisuth, Chetta Ngamjarus, Kittisak Sawanyawisuth Therapeutics and Clinical Risk Management, 143-162, 2023

Adherence to Continuous Positive Airway Pressure Therapy in Pediatric

Patients with Obstructive Sleep Apnea: A Meta-Analysis

Introduction Obstructive sleep apnea (OSA) is a public health problem that affects children. Although continuous positive airway pressure (CPAP) therapy is effective,

The CPAP adherence rate in children is varied. This study aimed to evaluate the CPAP adherence rate and factors associated with CPAP adherence in children with OSA using a systematic review.

Methods

The inclusion criteria were observational studies conducted in children with OSA and assessed adherence of CPAP using objective evaluation. The literature search was performed in four databases. Meta-analysis using fixed-effect model was conducted to combine results among included studies.

Results

In all, 34 studies that evaluated adherence rate and predictors of CPAP adherence in children with OSA were included, representing 21,737 patients with an average adherence rate of 46.56%. There were 11 calculations of factors predictive of CPAP adherence: age, sex, ethnicity, body mass index, obesity, income, sleep efficiency, the apnea-hypopnea index (AHI), severity of OSA, residual AHI, and lowest oxygen saturation level. Three different factors were linked to children with adherence and non-adherence to CPAP: age, body mass index, and AHI. Conclusion The CPAP adherence rate in children with OSA was 46.56%. Young age, low body mass index, and high AHI were associated with acceptable CPAP adherence in children with OSA.

1.2.3 Parisa Jean Mohammad, Tahereh Raisi, Mehtab Zeraei, Maryam Movidinejad, Roya Karimi, Zahra Mirali, Reza Zafari, Shahab Alizadeh Respiratory Medicine, 107122, 2023

Adipocytokines in obstructive sleep apnea: a systematic review and meta-analysis

background and objective

Adipocytokines play an important role in obstructive sleep apnea (OSA) by mediating inflammatory responses. Previous studies reported that OSA is associated with an alteration in serum levels of adipocytes. However, the results remain controversial. This meta-analysis aims to evaluate the relationship between OSA and the circulating level of adipocytes in adults and children.

Methods

A comprehensive search of the Medline/PubMed and Scopus databases was performed for relevant articles published from creation through July 2022. Weighted mean differences (WMDs) and 95% confidence intervals (CIs) were used to assess the strength of the association between concentrations of adipogenesis with OSA.

Results In the overall analysis, in contrast to IL-10, which showed a significant decrease, IL-1ß, IL-4, IL-8, IL-17 and IFN-gamma showed higher levels in OSA patients than in the control groups ($p < 0.05$).

In adults, IL-1B, IL-8, IL-17, IL-18, vaspin, visfatin, and chemerin were associated with higher serum levels in patients with OSA, while significantly lower IL-5 and IL-10 were detected in Adults with obstructive sleep apnea compared to healthy adults. In children with OSA, serum levels of IL-4, IL-8, IL-12, IL-17, IL- 23, and IFN-gamma were significantly higher than in healthy children.

Conclusion

Levels of inflammatory markers were found to be higher in OSA patients compared with control individuals, suggesting that adipogenesis may contribute to OSA pathology.

(1.2.4) Yun Han Shi, Hong Fei Lu, Hui Jun Wang, Yi Zhu, Li Wang, Yan Ru Li, Di Min Han Journal of Clinical Sleep Medicine, jcsm. 10402, 2023 STUDY OBJECTIVES:

Changes in nasal resistance (NR) during postural changes are affected by venipuncture.

Analysis of the mechanism of regulating nasal resistance during postural changes in Obstructive sleep apnea patients by measuring heart rate variability

Filling and mediating pressure in the autonomic nervous system (ANS) and heart rate HRV can reflect changes in the ANS. This study aims to explore Regulatory mechanisms of NR in patients with obstructive sleep apnea (OSA) during sleep Postural changes.

Methods:

Healthy controls (apnea apnea index (AHI) (5 events/h) and patients with OSA) were recruited. NR and electrocardiogram (ECG) data were collected in sitting, supine, left lateral, and right lateral positions. HRV parameters by analyzing the ECG data from each position.The subgroups were divided according to the NR changes sitting and lying down, and the HRV parameters were compared between the different positions and groups/subgroups.

results:

In all, thirty-four healthy controls and thirty-nine patients with OSA were recruited. During the sitting-recumbent position changes, NR increased in the control group but did not change significantly in the OSA group. None of the HRV parameters related to ANS changed significantly. After dividing the groups into elevated NR and unaltered NR subgroups, HRV parameters associated with sympathetic activity were higher in the unaltered NR subgroup but only statistically significant in the OSA group. When comparing the right and left positions, there was no significant change in NR; However, the OSA group had lower parasympathetic activity-related HRV parameters when in the correct posture.

Conclusions:

During postural changes from a sitting to a supine position, the total NR increases, and this increase is smaller in patients with OSA. This is likely due to an over-regulation of sympathetic activity, which may occur in patients with OSA.

(1.2.5) Charles F. B. George, smiling Sleep 22(6), 790-795, 1999

Sleep apnea and motor vehicle crashes

background:

As a group, patients with obstructive sleep apnea (OSA) are at increased risk of motor vehicle accidents. Previous studies using actual incident data used only small numbers of people.

objective:

To determine the motor vehicle accident rate in a large number of OSA patients using objective data from the Ministry of Transportation Ontario (MTO).

Participants:

All cases of OSA were polygraph confirmed between June 1990 and June 1994.

Interventions:

OSA subjects were divided into groups based on their apnea-hypopnea index (AHI): (OSA1- AHI 10-25, OSA2- AHI 26-40, OSA3- AHI >40) and driving records were obtained from MTO. Age- and gender-matched controls were randomly selected from drivers in the MTO database of drivers with passenger vehicle licences. The analysis was restricted to drivers of the same class of licence.

Key outcome measures:

The primary outcome measure was accidents in the five years prior to diagnosis. A secondary outcome was citations over the same period. results:

There were 155 of the 460 OSA patients who had one or more episodes. The incidence rate/year, for the previous five years, was 0.07 ± 0.14 for controls versus 0.09 ± 0.14 for OSA ($p < 0.05$). This difference may be explained by the increased incidence rate in OSA patients with the highest AHI (OSA3) (MVA/year: 0.11 + 0.15, 0.08 + 0.12, 0.06 ± 0.14 for OSA groups 3, 2, 1

respectively) in which there were no differences. between control and OSA1 and OSA2 incidence rates. OSA patients had twice as many citations as Controls (1.74 + 2.13 although the citation types were similar.

Conclusions:

Increased motor vehicle accidents in OSA may be limited to more severe apnea (AHI >40). Despite the large sample size (an order of magnitude larger than previous reports using accident data) further study in larger numbers is needed, including more measures of disease severity and strict control of driving exposure.

3. Aim of the project

The doctor cannot diagnose sleep apnea, and usually the patient does not know that he has this disease, so designing a device that can help the doctor diagnose sleep apnea is very important. The goal of our project is to design a device that helps the doctor diagnose sleep apnea and alert the patient when the oxygen level in the body decreases using the alarm in the liquid crystal screens. When the oxygen level decreases in the body of the patient with sleep apnea, the device sends an alert to the doctor through a program Internet way. The device will contain 3 sensors; Heart rate sensor, temperature sensor for temperature measurement, ox meter for oxygen saturation measurement, these parameters will be displayed on the screen and sent to the mobile APP online.

1. Sleep Apnea

Our understanding of the nature and consequences of upper airway obstruction in adults during sleep has advanced dramatically over the past two decades. Sleep apnea - defined as recurrent episodes of obstructive sleep apnea and shortness of breath, combined with daytime sleepiness or altered heart and lung function - is common. Epidemiological studies estimate that the condition affects 2 to 4 percent of middle-aged adults. Only a small fraction of cases in this group of adults are diagnosed; This is related to the insufficient awareness of sleep apnea among physicians and the public in general also known as sleep apnea

Sleep apnea is a serious disorder in which breathing stops repeatedly long enough to disrupt sleep, often resulting in a temporary decrease in the level of oxygen and an increase in the level of carbon dioxide in the blood. Obstructive sleep apnea is the most common form of sleep-related breathing disorder. It causes breathing to repeatedly stop and start during sleep.

There are three types of sleep apnea

1. Obstructive sleep apnea
2. central apnea
3. Mixed apnea

2. Obstructive sleep apnea

Sleep apnea, the most common type of sleep apnea, is caused by repetitive closure of the throat or upper airway during sleep. These anatomical structures can change position during breathing.

This type of sleep apnea affects about 2 to 9% of people in the United States. Obstructive sleep apnea is more common in people who are obese.

Obstructive sleep apnea is defined as the repeated cessation of breathing during sleep for more than 10 seconds at a time. Patients have 5 to 30 or more episodes of sleep apnea.

Snoring is the most common symptom of obstructive sleep apnea, but not everyone who snores has obstructive sleep apnea. Snoring tends to be noisy in obstructive sleep apnea, with episodes of choking or respiratory arrest and sudden awakening, with a loud snoring sound. The patient may wake up suffocated and frightened.

In the morning, the patient is often not aware that he has been awakened several times during the night. Some patients may wake up with a sore throat, cough, and runny nose. When obstructive sleep apnea is severe, recurrent episodes of snoring and loud sleep-related snoring occur at night, as the patient experiences drowsiness or spontaneous falling asleep during the day.

The patient may have difficulty sleeping or concentrating. In patients who live alone, daytime sleepiness may be the most obvious symptom. Ultimately, drowsiness interferes with daily functioning and reduces quality of life. For example, a person may fall asleep while watching television, when attending a meeting, or when stopped at a red light while driving (in severe cases).

Memory may be affected, sexual desire may decrease, and social bonds between the patient and his peers may be impaired due to his inability to actively participate in social relationships due to drowsiness and irritability. The risk of stroke, heart attack, atrial fibrillation (a heart rhythm disorder) and high blood pressure is also increased. If middle-aged men experience sleep apnea more than 30 times an hour, they have a higher risk of dying. A premature baby

3. Obstructive sleep apnea in children

Certain conditions in children can cause obstructive sleep apnea, such as enlarged tonsils or adenoids, dental problems (such as an overbite), obesity, or certain birth defects (such as a small lower jaw).

Almost all affected children snore. Other nocturnal symptoms may include restless sleep and night sweats. Some children may wet their beds. Daytime symptoms include mouth breathing, morning headaches, and problems concentrating. Learning problems and some Behavioral problems (such as hyperactivity, impulsiveness, and aggression) are often common symptoms of severe obstructive sleep apnea in children. These children may also have a developmental delay. Excessive daytime sleepiness is less common in children than in adults with obstructive sleep apnea during the day.

Figure (2.1): Sleep apnea in children

Obesity syndrome

Obese patients can have hypoventilation syndrome (called Pickwick Ian syndrome) either alone or in combination with obstructive sleep apnea. Excess body fat can interfere with the movement of the chest on one side. On the other hand, excess body fat under the diaphragm puts pressure on the lungs, and these two factors combine to cause shallow, inefficient breathing. Excess fat around the throat compresses the upper airway, restricting airflow. Central breathing during sleep.

A doctor may suspect sleep apnea based on a person's symptoms. Doctors sometimes ask people to complete questionnaires to help detect symptoms, such as excessive daytime sleepiness, that may be caused by obstructive sleep apnea. The diagnosis is confirmed and its severity better determined when a test called polysomnography is performed. This test helps doctors distinguish between obstructive and central sleep apnea.

Obesity, combined with aging and other factors, leads to narrowing of the upper airway. Excessive alcohol use and use of sedatives exacerbate sleep apnea.

Factors that increase the risk of developing sleep apnea include a narrow throat, a thick neck, and a round head (all of which are genetic characteristics.

Hypothyroidism or excessive and abnormal physical development caused by excessive growth hormone production (acromegaly) can also contribute to sleep apnea.

Obstructive apnea is likely to occur in different patients for different reasons with four primary phenotypic features likely to explain the presence or absence of OSA and its severity in most of these patients. Features are described in the following sections.

anatomy

Most patients with OSA have an anatomically small pharyngeal airway .This may be due to obesity, bone structures, tonsils, adenoids, etc. However, anything that reduces the volume of the nasopharyngeal airway will increase the likelihood of developing sleep apnea. This reduced nasopharyngeal airway volume has been demonstrated by a variety of techniques, including computed tomography, magnetic resonance imaging (Figure 1), and direct visualization of the airway awake and asleep with or without muscle activity. All of these studies indicate that patients with sleep apnea have an anatomically small airway, and obesity is the most common cause.

Obstructive sleep apnea is a serious medical condition. Its

complications may include:

Fatigue and feeling sleepy during the day. Because of a lack of restorative sleep at night, people with obstructive sleep apnea often feel very sleepy during the day, tired, and easily excitable. They may have difficulty concentrating, and may fall asleep while working, watching TV, or even while driving. And it can make them more vulnerable to work-related accidents.

Children and young adults with obstructive sleep apnea may perform poorly in school, and they may have problems with attention or behavior.

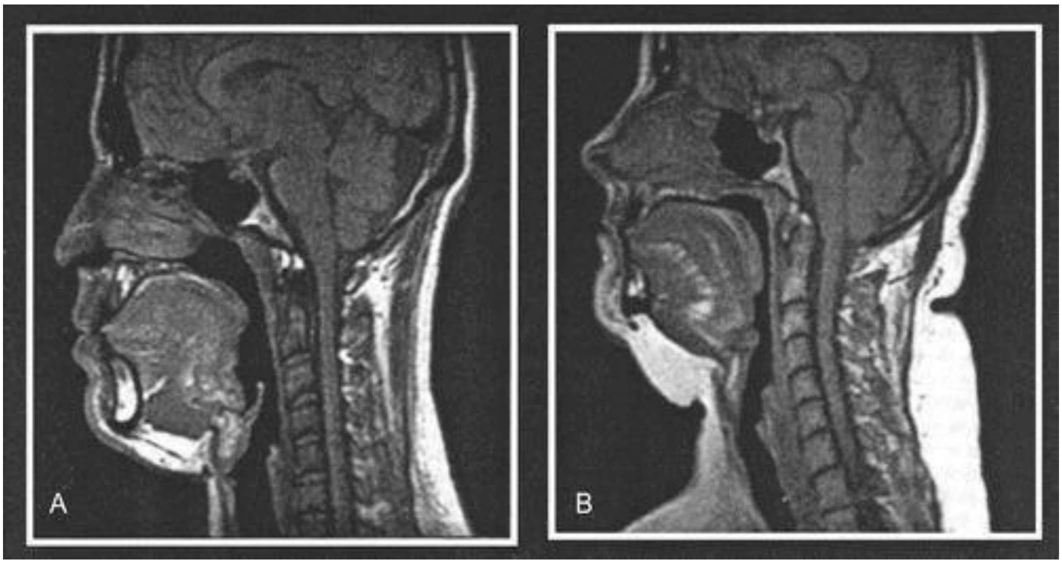


Figure 2.2 X-rays for the normal person and the obese person

Sagittal magnetic resonance images from (A) a normal subject and (B) a patients with obstructive sleep apnea are demonstrated. Note that the airway behind the uvula, soft palate, and tongue are considerably smaller in the patient with apnea than the normal control subject. This is the site of pharyngeal collapse in the patient with apnea. Reprinted by permission from Schwab RJ. Upper airway imaging.

The more weight, the thicker the neck. When the percentage of fat in the throat increases, the airway becomes smaller. Fat does not collect in the airway wall, but around it. And when muscle tone decreases during sleep, the fat tissue actually becomes a mass over the airway and causes it to fold. So, the more weight you gain, the more difficult it is to breathe during sleep, exacerbating your sleep apnea. In other words, the more fat in the throat, the more likely the airway is to become obstructed. Obesity is a significant risk factor for worsening

sleep apnea.

Cardiovascular problems. The sudden drop in oxygen levels that occurs during obstructive sleep apnea causes high blood pressure and stresses the cardiovascular system. Many people with obstructive sleep apnea have high blood pressure, which may increase their risk of heart disease.

The more severe the obstructive sleep apnea, the greater the risk of coronary artery disease, heart attack, heart failure, and stroke.

Obstructive sleep apnea also increases the chances of an irregular heartbeat (arrhythmia), which can lead to low blood pressure. If an underlying heart disease is present, repeated and multiple episodes of arrhythmias can lead to sudden death. Complications with medications and surgery. Obstructive sleep apnea is also a problem with some medications and general anesthesia. Where these drugs - such as sedatives, narcotic analgesics, and general anesthetics - lead to relaxation of the upper airway; This may cause worsening of obstructive sleep apnea. If you have obstructive sleep apnea, major surgery, especially after sedation and lying on your back, may make your breathing problems worse. People with obstructive sleep apnea may have an increased risk of complications in the postoperative period Before undergoing any surgery, be sure to tell your doctor if you have obstructive sleep apnea or any associated symptoms. Your doctor may consider that you be screened for obstructive sleep apnea before surgery. eye problems Some research has found a link between obstructive sleep apnea and certain eye conditions such as glaucoma. Eye complications can usually be treated. Depriving your partner of sleep. Loud snoring can prevent others around you from getting plenty of rest, ultimately hurting your relationships. Some partners may prefer to sleep in another room.

5. Central sleep apnea

Central sleep apnea, a much rarer condition than sleep apnea, results from a problem with breathing control in the brain stem. Normally, the brain stem is very sensitive to changes in blood levels of carbon dioxide (a product of secondary to metabolism). The brainstem is less sensitive to changes in carbon dioxide levels. As a result, patients with central sleep apnea breathe less deeply and more slowly than usual. Some opioids used for pain relief and some other medications can cause central sleep apnea. Climbing high altitudes can also cause central sleep apnea. Central sleep apnea can also occur in people with heart failure. A brain tumor is a very rare cause of central sleep apnea. Unlike obstructive sleep apnea, central sleep apnea is not associated with obesity. In a form of central sleep apnea called Ondine curse, which usually occurs in newborns, people may not breathe enough or not at all unless they are fully awake.

Snoring is not a distinguishing feature of central sleep apnea. However, the

respiratory rhythm is disturbed and may stop for short periods. Cheyne-Stokes breathing (cyclic breathing) is a type of central sleep apnea. In Cheyne-Stokes breathing the breathing rate increases gradually, then It gradually slows until it stops for a short time, then comes back again. This cycle continues over and over again. Each cycle lasts about 30 seconds to 2 minutes.

6. Mixed sleep apnea

Mixed sleep apnea, the third type of sleep apnea, is a combination of central and obstructive factors occurring in a single episode of sleep apnea. Episodes of mixed sleep apnea usually begin as obstructive sleep apnea and are treated in the same way as obstructive sleep apnea

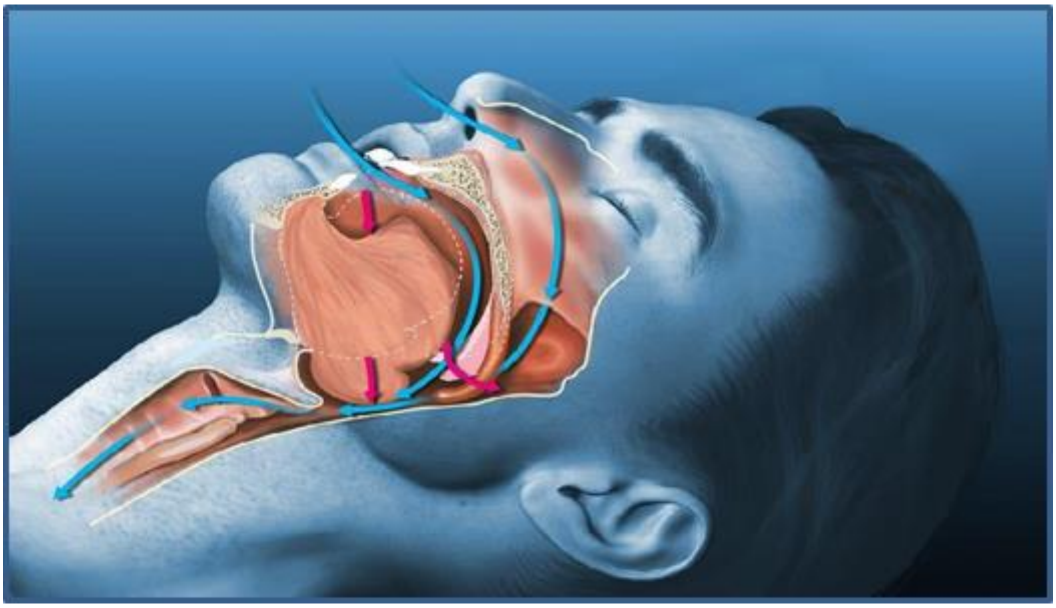


Figure (2.3): Mixed sleep apnea

7. In a sleep study:

An electrocardiogram (ECG) is used to monitor changes in sleep levels and eye movements. An oximeter is used to measure the level of oxygen in the blood, which is placed on the finger or earlobe. Airflow is measured using devices placed in front of the nostrils and mouth. Chest movement and breathing pattern are measured using a monitor placed on the chest. Often, portable home monitoring devices are used to help diagnose sleep apnea. These devices measure heart rate, blood oxygen level, respiratory effort, posture, and nasal airflow. Sometimes additional tests are needed to help the doctor determine the cause. People with obstructive sleep apnea may undergo further tests to check for complications that may result from the condition, such as heart failure, high blood pressure, and atrial fibrillation. With central sleep apnea, testing is seldom needed to determine whether or not a person is asleep. Portable, unsupervised monitoring systems that can be used outside the hospital are a more cost-effective alternative to standard diagnostic nocturnal polysomnography. Whether an abbreviated test, in-hospital or out- of-hospital, can successfully establish a diagnosis of obstructive sleep apnea is a controversial topic. Portable systems differ in the way physiological signals are recorded and recorded, as well as in whether cardiopulmonary variables alone, or sleep and cardiopulmonary variables together, can be monitored. A major concern with the use of portable monitors is that airflow, ventilation effort, and agitation may not be measured at all (or may be measured with less accuracy than in a laboratory) and so the monitors may miss episodes of hypoventilation or agitation due to upper airway resistance.

1. PARTES

1. DHT11 Digital Temperature and Humidity Sensor

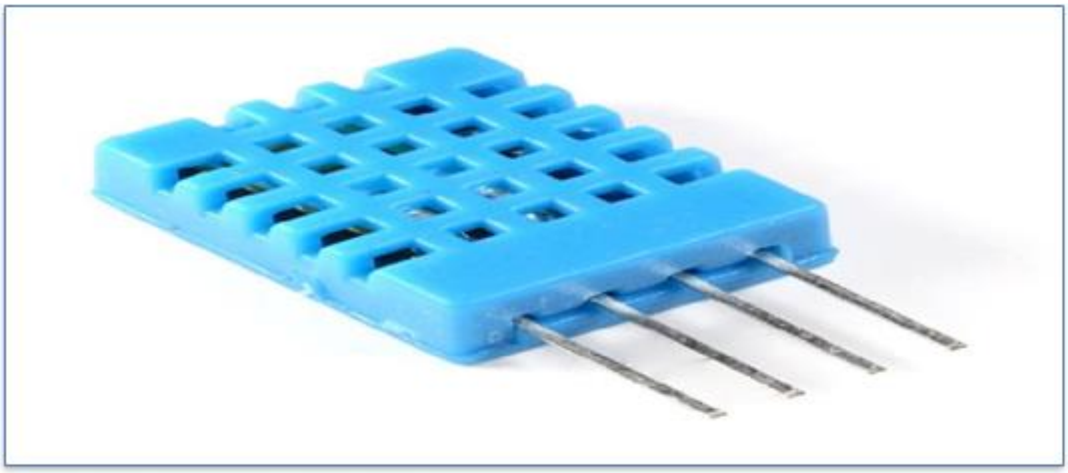


Fig (3.1). DHT11 Digital Temperature and Humidity Sensor

Temperature and humidity sensor, high quality, low cost, gives a reading every one second, ideal for reading humidity levels between 20-80% with an accuracy of 5%, and temperatures between 0-50°C with an accuracy of ±2° C

DHT11 DHT-11 Digital Temperature and Humidity Temperature Sensor

Features**:**

1. DHT series numeric humiture sensor.
2. Humidity measuring range: 20%~90% RH (0-50°Ctemperature compensation).
3. Temperature measuring range: 0~+50°C.
4. Humidity measurement accuracy: 15.0%RH.
5. Temperature measurement accuracy: ±2.0°C.
6. response time: <5s.

7. low power consumption.
8. Size:2.3cm x 1.2cm x 0.5cm.

2. Red Nokia 5110 84x48 LCD

Fig (3.2).Red Nokia 5110 84x48 LCD

Nokia 5110 LCD screen used in electronic projects to display graphics and data received from Arduino with a resolution of 128 x 64

The name of this product itself is enough to explain its origin. Yes of course !!! this LCD module was used in old Nokia 5110/3310 cell phones. Now its been widely used by hobbyists for graphics, text etc.

Though it's an industrial module, this LCD display is extremely easy to use. The Nokia 5110 is a basic graphic LCD screen for lots of applications. It was originally intended for as a cell phone screen.

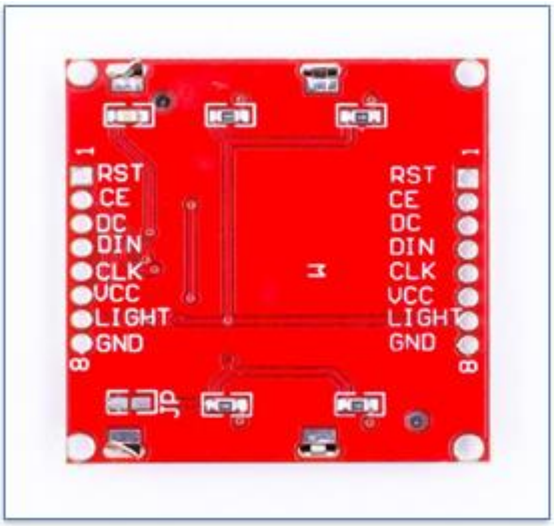


Fig (3.3) ***Nokia screen inputs and outputs***

Pin Configuration:

(Reset) RST--> D3

(Chip Selection) CE-->D4 (Data/Commands Choice) DC-->D5 (Serial Data Line)Din-->D6

(Serial Clock Speed.)CLK-->D7 (Backlight Control Terminal) BL -->Gnd Vcc--> 5v to 7V

Gnd->Gnd

Pin No:Pin Name: Description1 ResetThis pin resets the module. It an active low pin (resets when OV is provided)2Chip Enable (CE)This pin is made low (OV) to select this particular display when more than one SPI peripherals are used.3 Data/Command (DC)This pin is used to switch between Data mode (high) and Command mode (low)4Serial Input (DIN)This is the input pin (MOSI) through which serial instructions are sent5Clock (CLK)All SPI modules require a common clock, this clock source is supplied to this pin6Power (Vcc)This pin is used to power the display the supply voltage is from 5V to 7V7Back Light (BL)Connects to the ground of the circuit.8Ground (Gnd) Connects to the ground of the circuit.

Operation of Nokia 5110 LCD Display Module at 3.3V

Operation of Nokia 5110 LCD Display Module at 3.3V

Many devices that can be used with an Arduino, require a power supply of 3.3V. This is also the case with the Nokia 5110. The best way to deal with 5V devices is to take an Arduino Pro, which can run on 5V.

Thanks to the internal clamp of the PCD8544 we can use a very simple level shifter. Four current limiting resistors of 10k can do the job. When an LCD control line is high, the current through the 10kQ resistor is just 40uA, so this is harmless. Note that we can't read back from the LCD with this circuit.

Operation of Nokia 5110 LCD Display Module at 5V Because VDD max = 7V

LOLIN V3 is an open source board that is used to build devices and connect

them to the Internet via Wi-Fi through the ESP8266-12E chip.

The All new NodeMcu ESP8266 V3 Lua CH340 Wifi Dev. Board is a fast leading edge low-cost WiFi technology. Modern high-level mature LUA based technology. It is an integrated unit with all available resources on board. It is super simple to complement your existing Arduino projects or any development board that has I/O pins available.

Modern Internet development tools such as Node.js can take advantage the NodeMCU with the built-in API to put your idea on the fast track immediately. NodeMCU is built based on the mature ESP8266 technology to take advantage of the abundant resources available on the web.

NodeMCU has ESP-12 based serial WiFi integrated on board to provide GPIO, PWM, ADC, 12C and 1-WIRE resources at your fingertips, built-in USB-TTL serial with super reliable industrial strength CH340 for superior stability on all supported platforms. This module is one of the cheapest available wifi-modules in the market. V3 or Version3 is the latest version of this module. This tutorial, however, will facilitate you to connect all the versions of ESP8266 NodeMcu, i.e V1, V2 or V3.

Arduino-like hardware 10 - Advanced API for hardware 10, which can dramatically reduce the redundant work for configuring and manipulating hardware. Code like Arduino, but interactively in Lua script.

Nodejs style network API Event-driven API for network applications, which facilitates developers writing code running on a 5mm5mm sized MCU in Nodejs style. Greatly speed up your IOT application developing process.

Development Kit The Development Kit based on ESP8266, integrates GPIO, PWM, IIC, 1-Wire and ADC all on one board. Power your development in the fastest way combination with NodeMCU Firmware!

The NodeMcu is an open-source firmware and development kit that helps you to prototype your lot product with few Lua script lines. The Development Kit based on ESP8266, integrated GPIO, PWM, IIC, 1-Wire and ADC all in one board

Features:

1. Uses CH340G instead of CP2102.
2. Wireless 802.11 b/g/n standard
3. WiFi at 2.4GHz, support WPA/WPA2 security mode
4. Support STA/AP/STA + AP three operating modes
5. Built-in TCP/IP protocol stack to support multiple TCP Client connections (5 MAX)
6. Support UART / GPIO data communication interface
7. Remote firmware upgrade (OTA)
8. Support Smart Link Smart Networking
9. ESP8266 has 10 Pin
10. Don't need to download resetting
11. A great set of tools to develop ESP8266 12 Lowest cost WI-FI
13. FOR Arduino like hardware 10
14. Greatly speed up your IOT application developing process
15. Open-source, Interactive, Programmable, Low cost, Simple, Smart, WI-FI enabled
16. WI-FI MCU ESP8266 integrated and easy to prototyping development kit.
17. We provide the best platform for lot application development at the lowest cost.
18. NodeMCU has built-in USB-TTL serial with super reliable industrial strength CH340G for superior stability on all supported platforms.
19. Advanced API for hardware 10, which can dramatically reduce the redundant work for configuring and manipulating hardware.
20. Event-driven API for network applications, which facilitates developers writing code running on a 5mm*5mm sized MCU in Nodejs style

4. Low Power MAX30102 Heart Rate Oximeter (SPO2) Sensor

The MAX30102 infrared heart rate and blood oxygen sensor is used in electro medical projects such as monitoring the vital activities of athletes or patients. It is compatible with Arduino or Raspberry Pi and other microcontrollers.

Overview:

Wearables

Heart-rate monitor

Pulse oximeter

Can replace MAX30100

Features:

Optical Heart-Rate Monitor and Pulse Oximetry Solution

Tiny 12.7mm x 12.7mm (0.5in x 0.5in) Board Size Low Power

Device Drivers

Free Algorithm

Example C Source Code For Arduino And mbed Platforms

Test Data

Competitive Advantages

Highly integrated, small-size sensor

Non-chest based heart-rate/SpO2 detection

Ultra-low power consumption

2. Connection

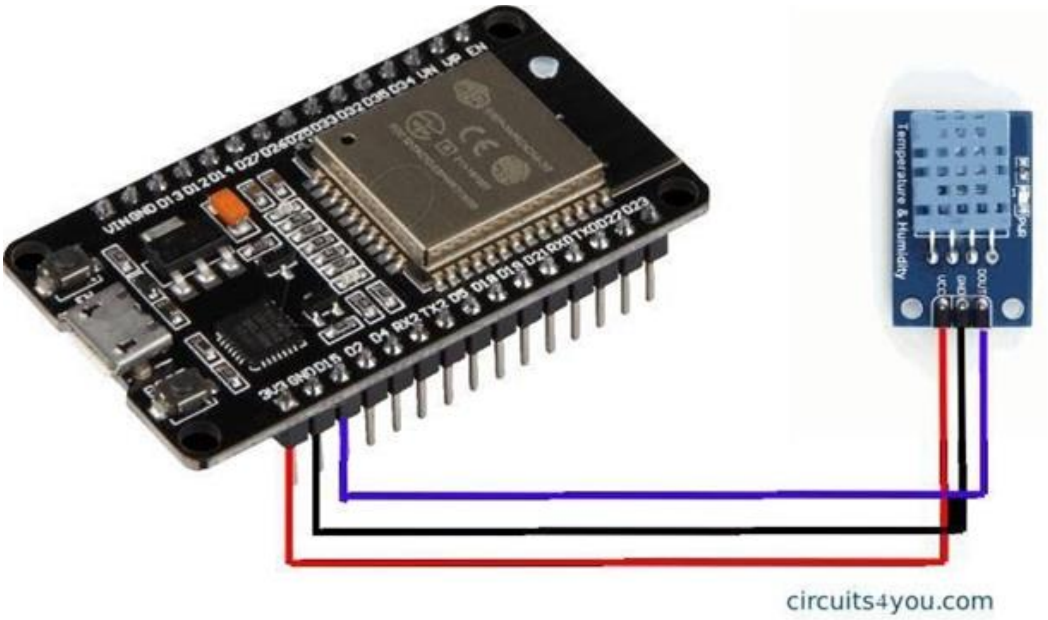
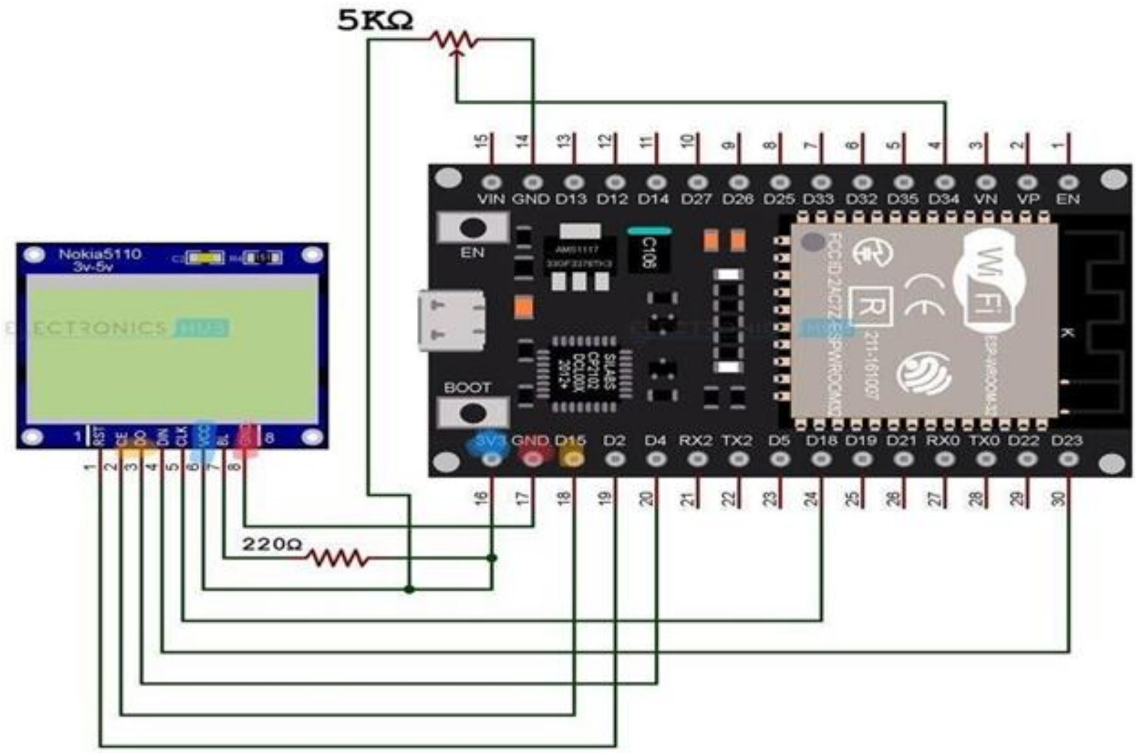


Fig (3.7) Connecting Node MCU CH340 with DHT11 Digital Temperature and Humidity Sensor:-

Connect using 3v3 output cable with UCC

Connect using the GND output cable to GHD

Connect using keel output D15 with DoUT



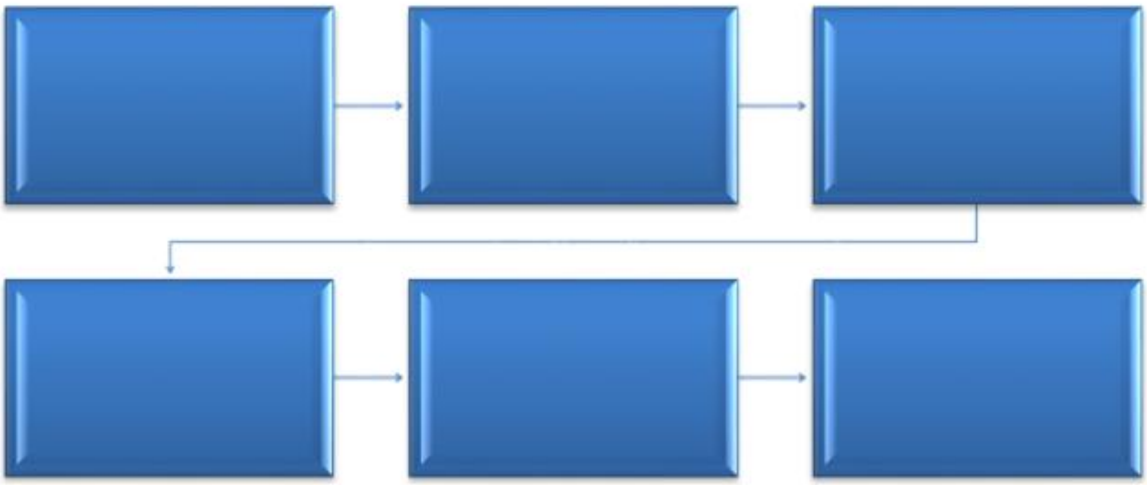


Fig (3.8) Connecting Node MCU CH340 with Nokia 5110

Connect using a DO

output cable with D4

Connect using DIN

output cable with D23

Connect using CLK

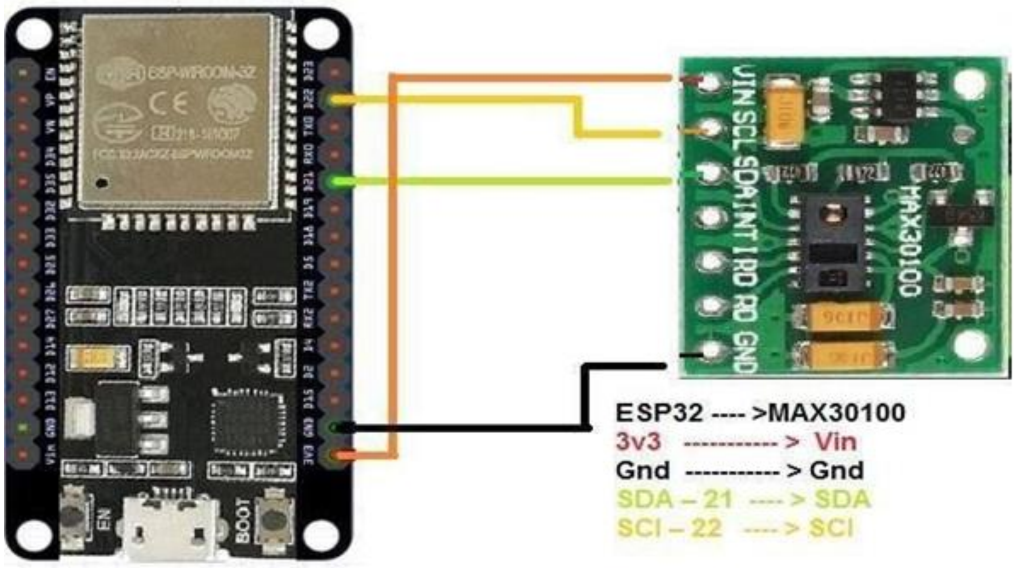
output cable with D18

Connect using a Vcc output cable with a resistance of 5 with GND and also in series with the BL output with 3v3

Connect using a BL output cable with a resistance of 220 with 3v3

Connect using the GND

output cable to GND



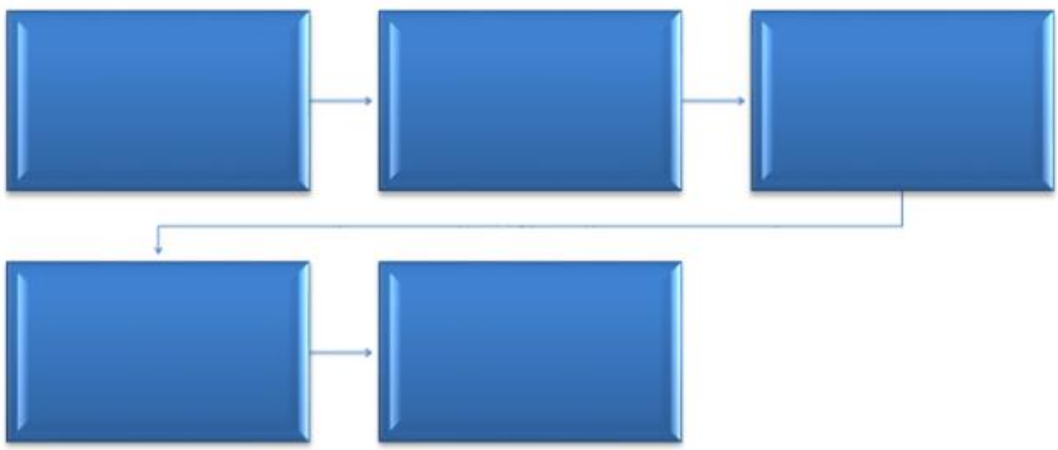


Fig (3.9) Connecting Node MCU CH340 with Low Power MAX30102 Heart Rate Ox meter (SPO2) Sensor

Connect esp32 with

max30100

Connect using SCL22 output cable with scl

And connect using a 3v3 output cable with Vin

And connect using the GNE output cable with GND

Connect using SDA 21 output cable with SDA

Fig (3.10) Device design

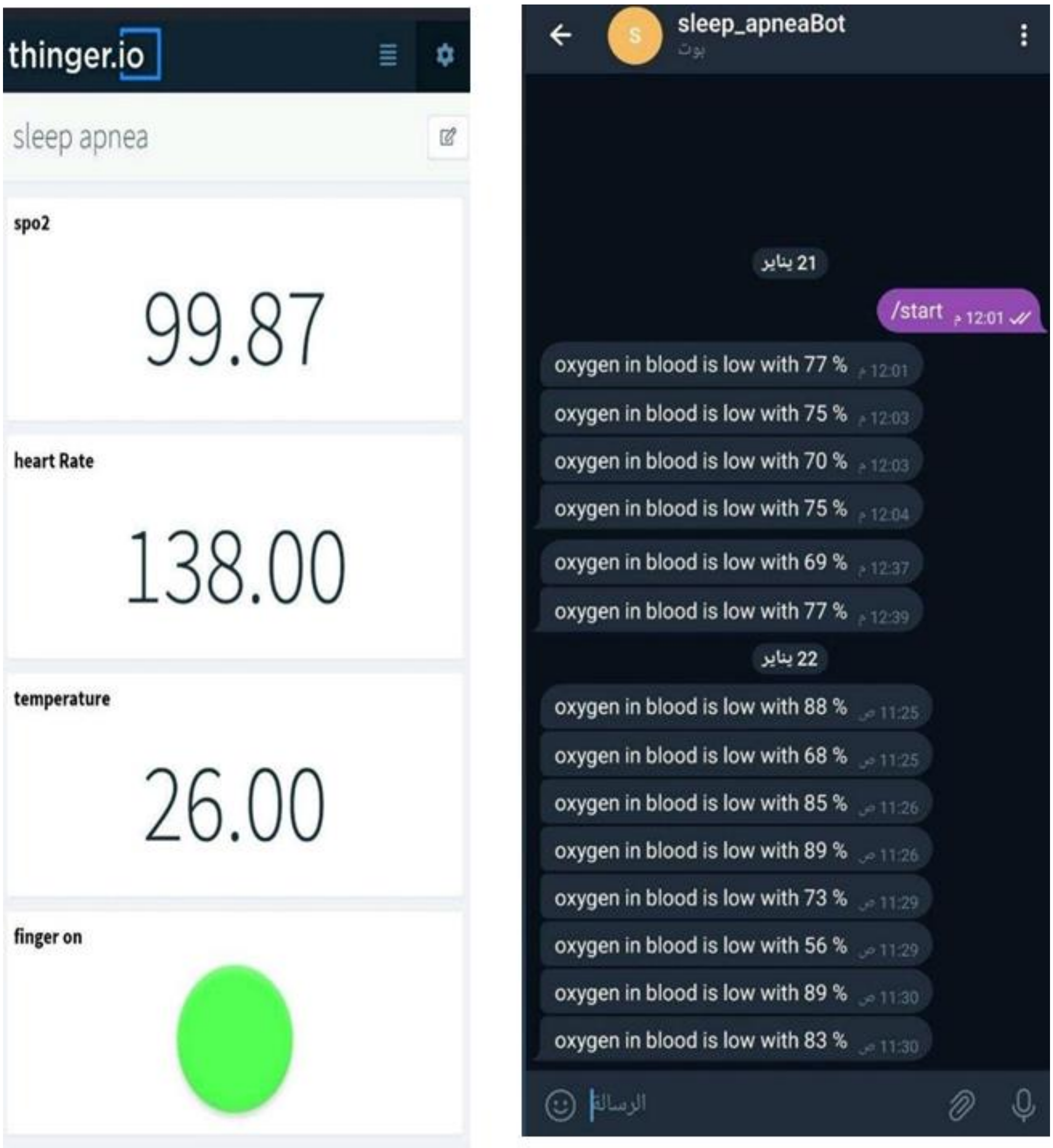


Fig (3.11) Programs used to read sensors

After completing the process of connecting the parts of the device with each other, I also made an account in the thinger program to read the used sensors of temperature, oxygen, and heartbeats when the doctor or accompanying person was far from the patient and wanted to follow up on the patient's health. He could use the thinger program to monitor the reading of the sensors. We also made a bot in The telegram program is used to receive the low oxygen alert, and we programmed the device when the oxygen drop is below 90. It sends an alert on the telegram bot so that the doctor comes and rescues the patient as soon as possible.

Conclusion

Sleep apnea is a serious disease. If the duration of sleep apnea is prolonged, the body will lose oxygen, which will lead to insufficient oxygen reaching the brain to work. Therefore, the brain will not work properly, which leads to clotting in the brain. Therefore, after conducting many studies and research, we have done Simple and low cost device

It helps to know the failure of the patient's respiratory system quickly and effectively, as the device that will be designed diagnoses the patient's condition by stopping breathing through heart rate, body temperature and oxygen sensors using sensors

To get accurate results and alert the doctor or the person who monitors the patient's condition, the device sends the results of the sensors through an application on the Internet, and the results are displayed on an application on the mobile phone. Therefore, when breathing stops, it sends an alert to a doctor to quickly come to help the patient by giving the necessary treatment

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