

# DETECTION OF SLEEP APNEA USING PRESSURE SENSOR

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**Abstract** - Generally, 13.7% of the Indian population is being affected by sleep apnea. Patients having neurological disorders which affects the movement of the tongue it is difficult to detect Sleep Apnea which is caused due to the blockage of the airways. When we go for conventional sleep detection systems, it might be inaccurate and hence to overcome this, we use pressure sensors which are fixed to a flexible PCB containing lithium battery which will be placed at the palette of the mouth which becomes more convenient in the detection of apnea. When we use this method, it is very efficient in providing treatment, easy to handle, and also provides accurate output.

**Key Words:** Sleep apnea, Tongue pressure, Palate, Internet of things (IOT), Piezoresistive pressure sensor

## I. INTRODUCTION

Sleep apnea, is also called sleep apnoea, is a sleep disorder where a person will be having pauses in breathing or shallow breathing during sleep. Every pause can last for even few seconds to a few Minutes, and they happen many times at night. Most commonly, this follows loud snoring. There may be a snorting sound or choking as breathing resumes. This takes place because the disorder disrupts normal sleep, those affected may experience sleepiness, or they might feel tired during the day.

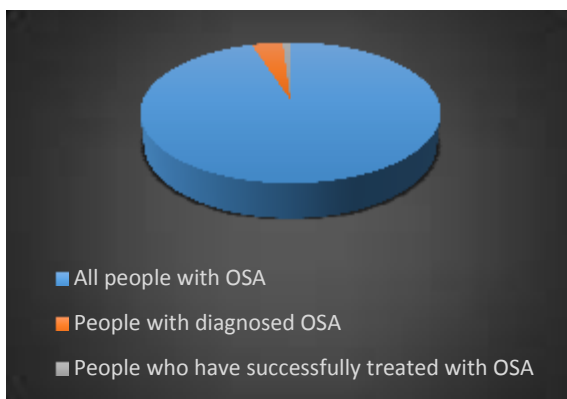


Fig.1.General statistics of Sleep apnea

Obstructive sleep apnea (OSA) is considered as the most common category of sleep-disordered breathing. The muscle tone of the body generally, relaxes during sleep, and at the level of the throat, the human airway is being composed of collapsible walls of soft tissue which tend to obstruct breathing. Mild sleep apnea, that occurs occasionally which

many of the people experience during an upper respiratory infection, is not considered to be significant, but chronic severe obstructive sleep apnea requires treatment to prevent sleep deprivation, low blood oxygen, and many other complications.

In pure central sleep apnea, the brain's respiratory control centres are imbalanced during sleep due to which there is a cause for apnea. Neurological feedback mechanism and blood levels of carbon dioxide do not react quick enough to maintain an even respiratory rate. The patient stops breathing and then starts again. There is no effort made to breathe during the pause in breathing, there are no struggling, and no chest movements. After the episode of apnea, breathing may be faster for a period of time, which act as a compensatory mechanism to absorb more oxygen and blow off retained waste gases.

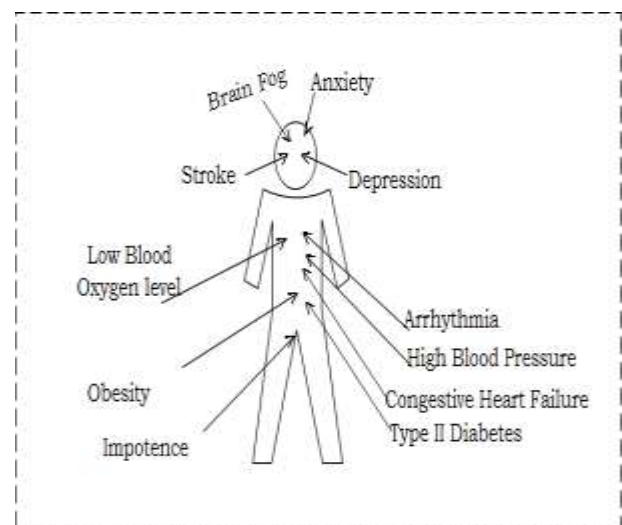


Fig.2. Side effects of sleep apnea

## II. METHODOLOGY

In our project, we use pressure sensor for sense the changes in the pressure distribution of the tongue in the mouth. For detecting sleep apnea during sleeping, we use differential pressure sensor and this sensor is placed on the palate using a flexible PCB made up of silicon.

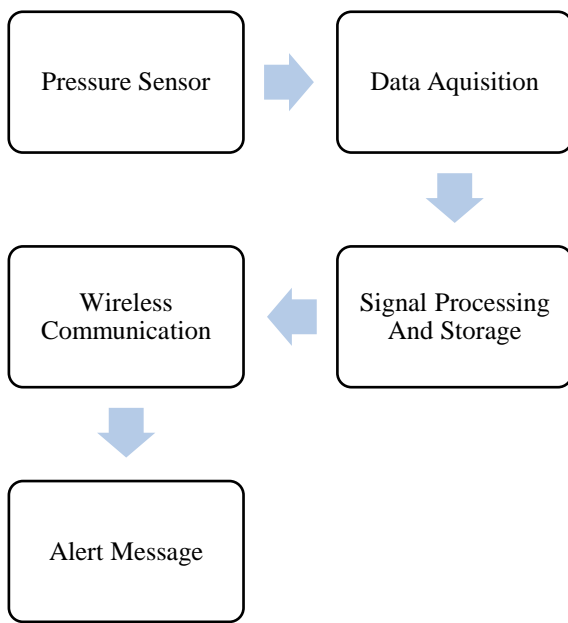


Fig .3. Block diagram of the system

### III. PROPOSED SYSTEM

#### Pressure Sensor:

The Pressure Sensor usually acts as a transducer, it generates a signal as a function of pressure imposed.

#### Data Acquisition:

Data Acquisition is the process of measuring a physical or electrical phenomenon such as current, voltage, pressure, temperature, or sound with a computer.

#### Signal Processing:

Signal processing focuses on modifying, analyzing, and synthesizing signals such as sound, images, and biological components.

#### Internet of Things:

It is a system that has the ability to transfer data over network using internet without the use of human to human or human to computer interaction.

#### Display:

A display device is an output device for presentation of information in visual form.

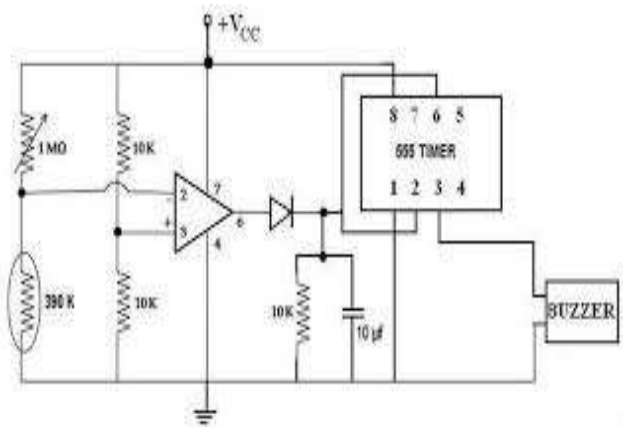


Fig4. Circuit Diagram

The pressure sensor chip used is silicon micromachined piezoresistive pressure sensing chip which provides the highest possible accuracy. This sensor is being placed on the upper palate of the mouth with the help of flexible PCB.

When the normal pressure of the tongue changes, the sensor detects the changes in pressure and convert it into electrical signals. Then the signals are fed into the data acquisition electronics. The pressure sensing chip is used for further processing and storage. The ADC converts the signals into a digital form to obtain the required result. Then wireless communication is being used for transferring the information from the control system to the access point.

Here, IOT (Internet of Things) is the mode of wireless communication which being used.

### III.CONCLUSION

Sleep apnea is one of the factors for different health conditions, including cardiovascular diseases. Despite the high rate of sleep apnea, only a small fraction of the population is diagnosed and monitored.

Hence, the project provides a sleep apnea monitoring device which detects the occurrence of sleep apnea where it can be analyzed online and in a wireless manner. It perfectly records the pressure of the patient which may be used to record the sleep apnea condition as it occurs. This device is moreover a portable device. As, differential pressure sensor is being used sleep apnea can be detected efficiently. The future work may be done by making the device more compact by changing the mode of power consumption.

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