Chapter 21
A Literature Review on Thyroid Hormonal Problems in Women Using Data Science and Analytics:
Healthcare Applications

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ABSTRACT

Currently, thyroid disorders are more common and widespread among women worldwide. In India, seven out of ten women are suffering from thyroid problems. Various research literature studies predict that about 35% of Indian women are examined with prevalent goiter. It is very necessary to take preventive measures at its early stages, otherwise it causes infertility problem among women. The recent review discusses various analytics models that are used to handle different types of thyroid problems in women. This chapter is planned to analyze and compare different classification models, both machine learning algorithms and deep leaning algorithms, to classify different thyroid problems. Literature from both machine learning and deep learning algorithms is considered. This literature review on thyroid problems will help to analyze the reason and characteristics of thyroid disorder. The dataset used to build and to validate the algorithms was provided by UCI machine learning repository.

INTRODUCTION

According to statistics and analytics, thyroid problems are on the rise in Indian women. Data science algorithms provide simple way to solve problem in medical data analysis. The life style of every person is changes due to various factors such as food, culture, environment and social media. It is very difficult to maintain their health. There is no conscious of regular exercise and diet. The hormonal changes of every person are changing drastically. The serious problem should need to take care in hormonal changes is thyroid stimulating hormones. The symptoms of thyroid are hair growth in face, rough skin, stress, depression and obese. The neural network models which explain the complexities of thyroid gland and different types of diseases have been explored. The complications results in thyroid disease are growing rapidly and provides data scientist to find new insights into thyroid hormonal problems by using deep leaning algorithms.

Data sciences afford most important aid in thyroid dataset with different algorithms for classification, clustering, association etc. The authors have used different types of machine learning and deep learning frameworks for thyroid dataset classification. Several startup companies like BUDDI.AI have come forward to carry out research in Thyroid problems.

Machine Learning (ML) is a subset of Artificial Intelligence (AI) is dominating in analytics era can provide prediction for most of the medical analytics problems. It is able to produce more accurate models based on the dataset. It permits the models to train on dataset before being installed. There are two types of models: online and continuous. Based upon the size and complexity of data, the patterns and relations could easily be perceived by common layman. Machine learning algorithms are essential to progress the correctness of predictive models. Deep learning is a subset of ML that includes the architecture of artificial neural networks in consecutive layers to study from data in an iterative nature. DL is particularly applied for huge unstructured data (otherwise called big data). The advantage of both data science and analytics algorithms models are used to predict outcomes.

This chapter is focused on thyroid hormonal problems, factors affecting thyroid hormones, types of thyroid diseases followed by machine learning algorithms, deep learning algorithms and literature survey for both with UCI machine learning repository dataset. Finally discussion and conclusion for complete literature review on thyroid problems in women using data science and analytics is presented.

BACKGROUND

Thyroid diseases are the most common endocrine disorder problem among Indian women. Banu (2016) explained that the thyroid is a butterfly formed organ situated in the human neck and ace organ of digestion. Chen et al. (2012) discussed that thyroid gland secreted two thyroid hormones namely triiodothyronine (T3) and thyroxin (T4). T3 and T4 are composed 50% of iodine. These hormones are in charge for regulation of metabolism. The shortage of iodine decreased T3 and T4 level and enlarges the thyroid tissue called simple goiter. The effects of triiodothyronine (T3) results increase cardiac arrest in man and infertility problems in women. When the level of thyroid hormones T3 and T4 go down too low, the pituitary gland segregates' Thyroid Simulating Hormone (TSH) which stimulates the thyroid gland to produces more hormones. Around 42 million people in India have thyroid disorders. Approximately one in 10 Indian women suffer from hypothyroidism, which means the thyroid gland does not segregate

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