Editorial on Thyroid Dysfunction Diagnosis

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Editorial

Thyroid dysfunction is a major endocrine disorder with serious health consequences, such as an increased risk of heart disease and hypercholesterolemia. One of the most difficult aspects of thyroid dysfunction treatment is not overlooking or misdiagnosing these diseases. Thyroid hormone excess and deficiency are frequently misunderstood and, as a result, are frequently overlooked and misdiagnosed. The diagnosis of hyperthyroidism may be delayed or missed because some symptoms are easily attributed to other conditions, such as stress, and are frequently misdiagnosed as cardiac disease or gastrointestinal malignancies.

Hypothyroidism can cause nonspecific constitutional and neuropsychiatric symptoms, and patients with hypothyroidism are frequently misdiagnosed with dementia, cardiac disease, liver disease, or hyperlipidemia, resulting in inadequate treatment. According to the American Association of Clinical Endocrinologists, 4.78 percent of the population in the United States has misdiagnosed thyroid dysfunction, and the authors argue that 15 million adults have unrecognised thyroid disease. It is estimated that 2.4 million patients in Japan require thyroid disease treatment. Only 450,000 of them, however, are receiving treatment. As a result, patients suffering from thyroid dysfunction are frequently overlooked and misdiagnosed.

Hyperthyroidism is a condition caused by an overproduction of thyroid hormones. Thyroid-stimulating hormone (TSH), free thyroxine (FT4), and free triiodothyronine (FT3) levels are measured first to diagnose hyperthyroidism (FT3). Hypothyroidism, on the other hand, is a condition in which serum thyroid hormone levels are low. Typical hypothyroidism diseases include Hashimoto's disease, which is diagnosed using anti-thyroid antibody tests such as anti-thyroid peroxidase antibody (TPO) and anti-thyroglobulin antibody (TgAb). Thyroid function tests and anti-thyroid antibody tests, despite their clinical importance, are not included in Japanese national health examinations.

Machine learning is highly regarded as a popular and effective approach to predictive analytics due to its success in diagnosis, prediction, and treatment selection. Recently, a new technique in medical informatics has used machine learning to accurately derive insights from medical records to support clinical screening and predict disease misdiagnosis. A study, for example, emphasised the superiority of machine-learning technology in predicting cardiovascular risk from routine clinical data. Another study used the results of a health check up to predict the occurrence of myocardial infarction or cerebral infarction. Numerous studies have also attempted to evaluate the effectiveness of detecting misdiagnosed diseases, such as thyroid dysfunction. In patients with both overt hyperthyroidism and overt hypothyroidism, there were strong, multiple correlations between a set of routine clinical parameters and FT4. These studies used pattern recognition methods like neural networks to predict the likelihood of thyroid dysfunction based on a battery of routine clinical tests.

Despite these efforts, there are still several concerns about machine-learning applications in disease diagnosis. These include data cleaning, missing value completion, and dysfunction labelling criteria, integrating multiple hospital datasets, and validating and interpreting machine-learning models. In this study, we created an explainable diagnosis support system using machine-learning algorithms to identify thyroid dysfunction in routine clinical data, and we demonstrated its potential to improve medical screening and prevent thyroid dysfunction from being overlooked or misdiagnosed. The discrimination of obvious hyperthyroidism and hypothyroidism was achieved with high accuracy using 23 routine laboratory tests, and these features may be useful for individuals who are not thyroid disease specialists.

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