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ALZHEIMER'S DISEASE PREDICTIVE TOOL BASED ON MULTIPLE BIOMARKERS AND MULTIPLE RISK FACTORS FORMULAE

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ABSTRACT

Alzheimer's disease (AD) is the most common form of dementia due to progressive mental deterioration. Reported recently, almost 50, 000 senior citizen aged 65 and above are affected with AD in Malaysia. This neurodegenerative dementia is serious but has no effective long-term treatment. The rapid development within the field of diagnostic measurement for AD observed in recent years offers new possibilities for scientists to invent more accurate tools in predicting susceptibility to the disease. Previous studies have seen the establishment of biomarkers as a significant method for predicting the risk or progression of AD. However, these considered the accuracy of one biomarker only. AD risk factors, on the other hand, have been a consideration in many studies but have not been properly modelled to be an advanced predictive tool. It is based on lifestyle choices that can help reduce the chance of developing the disease. Hitherto, well-established AD risk factors have never been considered for incorporation into a predictive tool and they only serve to indicate lifestyle choices that can help reduce the chance of developing the disease. In this work, a new predictive tool based on AD risk factors was developed. This is then incorporated into the existing biomarker predictive tools. A new mathematical model has been defined to describe the predictive tool based on disease profile that incorporates biomarkers and risk factors of AD. The tool has been demonstrated good accuracy of analysis for multiple factors related to AD. The formulae developed are based on the proportion of disease profile and several standard mathematical equations. The formulae were examined through three conditions of patients presenting; a) no biomarker with multiple risk factors, b) single biomarker with multiple risk factors, and c) multiple biomarkers with multiple risk factors. Findings in this work have shown that the developed predictive tool may offer the percentage of probability due to multiple biomarkers, multiple risk factors and single biomarker. It also reveals that the consideration in adding the risk factors as a predicting parameter could enhance the predicting result.

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CHAPTER 1

INTRODUCTION

1.1 Introduction

Every month worldwide approximately 870, 000 people achieve the age of 65 [1]. The increase in elderly population is associated with mental decline with worldwide new cases of dementia reported at approximately 4.6 million every year [2]. The most common cause of dementia occurring in middle or old age is Alzheimer's disease (AD) [3, 4].

AD is a progressive mental deterioration due to degeneration of the brain. Deterioration involves certain areas of the brain such as prefrontal cortex, medial temporal cortex, occipital cortex and hippocampus that control thought, memory, language, and behaviour [5-8]. AD is also a multi-factorial disease, affected due to deficiencies in nutrition, chronic stress, and lifestyle choices. People with AD may become anxious, aggressive, or tend to wander away from home where palliative care is needed [9, 10]. The caregiver must cope with changing levels of the ability and new patterns of behaviour of AD patients.

Currently AD has no cure to stop the destruction of brain cells that underlies the illness. Scientists have not yet conclusively identified any single reason for cell failure but there are a number of tools designed to diagnose dementia and AD. The first step in recognizing this illness is through a thorough medical examination. This may involve invasive procedures and expensive techniques.