

## ANALYSING THE ROLE OF ARTIFICIAL INTELLIGENCE IN PREDICTING MOOD OF MENOPAUSAL WOMEN

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**Abstract:** *Predicting depression in menopausal women is a challenging and intricate task in the medical field. Hormonal changes during puberty, pregnancy, menstruation, and menopause make depression and mood swings more prevalent in women than in men. Menopause often leads to depression, which in turn causes both mental and physical health issues, making it a significant concern for women going through menopause. However, there have been only a limited number of studies focused on forecasting depression in women experiencing menopause because of its complexity. Artificial Intelligence (AI) driven analysis of human emotions ranges from capturing the subtle complexities of emotional expressions to addressing broader concerns. This paper focuses on the applications of AI in forecasting depression in menopausal women.*

**Keywords:** menopausal women Mood prediction

### INTRODUCTION

Depression is a key symptom that can lead to various psychological and physical disorders. It is also observed that at times, psychiatrists, psychologists, and clinicians are uncertain about a patient's depression diagnosis due to the mildness of some symptoms. The shortage of specialists, along with limited knowledge and awareness, serves as the driving force behind the research aimed at predicting depression in menopausal women and improving their quality of life. Considering these situations there is a dire need for a machine learning-based model that can facilitate the initial diagnosis of depression in menopausal women.

Menopause is a natural and inevitable stage in every woman's life after which she becomes unable to conceive [1]. It marks the time when a woman's menstrual cycle ends, and the ovaries likely stop producing estrogen and progesterone [2]. The typical age range for menopause is between 45 and 55 years, with the average age being 50, as observed in China and Western countries [4-6]. Many women experience mental and physical challenges during this phase [8].

Menopause consists of various phases and stages. As per research conducted in Bangladesh on women experiencing menopause there are three distinct phases namely "pre-menopausal", "post-

menopausal” and “peri-menopausal” [9]. Women aged between 40 and 50 years are classified as naturally menopausal [7]. The women who experienced irregular menstrual cycles within the past 12 months or had their last period 3 months ago are referred to as “pre-menopausal” whereas those women who have not experienced menstrual bleeding in the past year are categorized as “postmenopausal” [10]. The period of transition into menopause is commonly known as perimenopause.

Every woman undergoing menopause faces various mental and physical challenges [3,8]. Menopause influences a combination of social, physical, and psychological changes, often leading to depression [11,12]. In fact, depression turns out to be a major cause of physical ailment in later stage of life [13,15]. Since menopause can lead to depression, which in turn causes both mental and physical health issues, this makes it a significant concern for women dealing with the issue. The depression rate in women is nearly twice as high as in men, affecting about one-fifth of all women [14,15]. Major depression is on the rise globally and is projected to become the leading cause of disease burden by 2030. Every year, approximately 73 million adult women suffer from major depression [22]. The rate of depressive syndrome among women experiencing menopause ranges from 5.9% to 23.8% [16-18]. Research indicates that perimenopausal women are 2 to 3 times more likely to experience a depressed mood than premenopausal women [19-21]. Understanding a female brain, that is immensely influenced by plenty of inevitable factors, is highly challenging, but Artificial Intelligence could be incredibly helpful in this process. Using machine learning (ML) techniques to predict depression symptoms in menopausal women holds great promise in the field of artificial intelligence.

**Predicting depression:** Predicting depression in menopausal women is an onerous and demanding task. Only a limited number of studies have been conducted to predict depression in women experiencing menopause. Chuni and Sreeramareddy, in 2011, demonstrated that menopausal symptoms occur in more than 50 percent of cases [25]. In 2015,

Bromberger et al. highlighted that severe depressive disorder is a major risk factor for middle-aged women [26]. The research on menopause is limited in countries like Bangladesh. Menopausal symptoms have not been studied as extensively in Southeast Asia as they have been in western countries [23]. In 2015, Juang et al. stated that in East Asian cultures, post and perimenopausal women experiencing hot flashes are linked to depression and anxiety disorders [27]. Another research conducted by X. Li et al. in 2015 contributed a system that used Artificial Neural Networks (ANN) to predict menopausal symptoms [24]. The study focused on the severity of the symptoms by measuring the sharpness of menopausal syndromes using the Kupperman Menopausal Index (KMI) but did not address depression or the likelihood of depressive symptoms in particular. In 2017, Zheng et al. introduced a scoring system that used two symptoms “hot flashes” and “sweating” in menopausal women to assess the risk of depressive syndrome [13]. Later, Mamun Ibn Bashar and colleagues demonstrated that eight factors are strongly linked to depression in both pre and post-menopausal women, encompassing both physical and psychological symptoms. However, depressive disorder is associated with a variety of symptoms, and women going through menopause may experience different types of symptoms. In 2022, Handing et al. carried out a region-specific study to identify the factors that predict depression among middle-aged and older adults in Europe [28]. In their results, menopause turned out to be a major factor contributing to depression in women experiencing menopausal stage.

Recent studies indicate that 67% of menopausal women attribute obesity to menopause, while 65% report making lifestyle changes to manage their menopause symptoms [29-32]. Forty-four percent of women experienced mild hot flashes and abnormal sweating pattern, 23% suffered from severe symptoms, and 45% dealt with mild sleep disturbances [33-35]. Thirty-six percent of women were experiencing mild depression, while 30% showed no symptoms. Twenty-nine percent of women had osteoporosis, 46% experienced joint

pain, and 25% made dietary changes during menopause period [36-39].

The above review clearly indicates that menopausal women's depression impairs their quality of life causing further serious physical illnesses. Due to lack of information and knowledge, the majority of women do not consider this. Other reasons to ignore the problem include the high expense and the limitations of mental diagnosis. In the era of scientific advancement, machine learning is essential for anticipating and identifying a wide range of problems in order to solve this type of issue.

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