

## Evaluation of the effect of the relationship between diet and microbiota on mental health

Ocena związku między dietą a drobnoustrojami na zdrowie psychiczne

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### Abstract

**Introduction.** The human body is home to hundreds of different types of microbes [bacteria, viruses, fungi], most of which are found in the gut. In recent years, studies have evaluated the impact of the gut microbiota on brain health, and there has been increasing emphasis on the role of dietary habits in supporting optimal mental health.

**Aim.** In this study, it is aimed to review the studies on the effect of the relationship between the microbiota-gut-brain axis and nutrition on mental health. This study will guide us on which nutrients we should add to our diet for mental health.

**Methods.** In this study, a narrative synthesis of observational studies covering diet, microbiota, nutrition and mental health was made using pubmed, sciencedirect and google scholar's databases. Studies are included if they include the result of microbiota and mental health, diet and mental health, the effect of nutrition on mental health, food groups and its relationship with mental diseases.

**Overview.** The regulation of the interaction between the gut and the brain through a healthy diet is important in the treatment of common mental disorders and in the prevention of disease.

**Conclusions.** By changing nutritional habits, microbiota can be changed, mental health can be protected and mental disorders that may occur can be prevented. Healthy eating habits can be emphasized by working on more food and patient groups in this area.

**Keywords:** Microbiota, diet, mental health, nutrition

### Streszczenie

**Wstęp.** Organizm ludzki jest domem dla setek różnych rodzajów drobnoustrojów [bakterii, wirusów, grzybów], z których większość znajduje się w jelitach. W ostatnich latach badania oceniały wpływ mikroflory jelitowej na zdrowie mózgu i coraz większy nacisk kładziono na rolę nawyków żywieniowych we wspieraniu optymalnego zdrowia psychicznego.

**Cel.** Celem niniejszej pracy jest przegląd badań nad wpływem zależności między osià mikrobioty-jelito-mózg a odżywianiem na zdrowie psychiczne. To badanie podpowie nam, jakie składniki odżywcze powinniśmy dodawać do naszej diety dla zdrowia psychicznego.

**Metody.** W tym badaniu dokonano narracyjnej syntezy badań obserwacyjnych obejmujących dietę, mikroflorę, odżywianie i zdrowie psychiczne, korzystając z baz danych pubmed, sciencedirect i google scholar. Badania są uwzględniane, jeśli obejmują wyniki dotyczące mikroflory i zdrowia psychicznego, diety i zdrowia psychicznego, wpływu odżywiania na zdrowie psychiczne, grup żywności i ich związku z chorobami psychicznymi.

**Przeгляд.** Regulacja interakcji między jelitami a mózgiem poprzez zdrową dietę jest ważna w leczeniu powszechnych zaburzeń psychicznych i zapobieganiu chorobom.

**Wnioski.** Zmieniając nawyki żywieniowe, można zmienić mikroflorę, chronić zdrowie psychiczne i zapobiegać zaburzeniom psychicznym, które mogą się pojawić. Zdrowe nawyki żywieniowe można podkreślić, pracując nad większą liczbą grup żywieniowych i pacjentów w tym obszarze.

**Słowa kluczowe:** mikrobiota, dieta, zdrowie psychiczne, odżywianie

### Introduction

The human body is home to hundreds of different types of microbes [bacteria, viruses, fungi], most of which are found in the gut. In recent years, studies have evaluated the impact of the gut microbiota on brain health, and there has been increasing emphasis on the role of dietary habits in supporting optimal mental health.

## **Aim**

In this study, it is aimed to review the studies on the effect of the relationship between the microbiota-gut-brain axis and nutrition on mental health. This study will guide us on which nutrients we should add to our diet for mental health.

## **Overview**

What is a Microbiota?

The microbiota is a set of microorganisms that live in advanced organisms, including humans, forming a unique entity called a holobiont[1]. Many places such as the human body, soil, water, plants, intestinal surfaces, our skin, and mouth surfaces are covered with microbiota. Disruption of the microbiota balance can increase the risk of disease and infection. It makes important contributions to the immune system and metabolism of the organism. Microbiota is of great importance in maintaining health and preventing diseases [2]. The entire genetic material of microorganisms necessary for an organism to survive is called the microbiome. The microbiome plays a role in the prevention of infections, immune system functions, and digestion of nutrients. The microbiome is affected by many things such as lifestyle, genetic factors, environmental factors [2].

Intestinal microbiota formation begins before birth. The mode of birth affects the formation of microbiota. In the formation of microbiota, the mother's intestinal microflora, environmental conditions at the time of birth, breast milk at the time of birth, mouth and microorganisms in the environment are very effective in the formation of microbiota. The gut microbiota affects all systems of the body. A bad gut microbiota can cause many disorders. It is important to have a dynamic and balanced gut microbiota for a healthy and fit body [3].

Microbiota refers to the bidirectional communication between the gut-brain axis, the gut microbiome and the brain [4]. The gut microbiota directly affects the brain, in part by modulating the presence of circulation tryptophan, serotonin, churine, and short-chain fatty acids, re-

sulting in neuropsychiatric disorders [5]. The gut microbiota has a very active role in regulating physiological and pathophysiological processes, the two-way interaction between the gut and the brain plays a major role in maintaining homeostasis [5].

Disease, infection, antibiotic use, genetic factors and diet can change the microbiota. Foods play an important role in changing the microbiota. Dietary changes affect the gene richness of the gut microbiota. The composition of the microbiota can be changed with the changes made in the foods consumed [6]. Inadequate nutrition or inappropriate diets disrupt the intestinal microbiota. Chemicals secreted from microorganisms in the intestine are transmitted to the brain via the vagus nerve and directly affect neurological functions [7].

#### Microbiota and diet

Diet is the most characteristic factor shaping the gut microbiota and immune system. The effect of diet on brain function suggests that diet will influence the development of mental health and psychiatric disorders.[8] Consumption of high fiber foods appears to promote an increase in bacterial diversity and is effective in the growth of beneficial bacteria, while reducing pathogenic bacteria. It has been observed that fatty acids influence improved memory, mood, attention and cognitive performance, reducing the risk of developing depression and controlling stress sensitivity [8].

In recent years, it has been reported that a good diet is necessary for good mental health. In studies, polyphenols are said to improve mental health. It was observed that depressive symptoms improved as a result of improving eating habits. In particular, there is a relationship between dietary polyphenol intake and a low depression rate. In the observational study with citrus fruit, it was observed that there was a low incidence of depression, while in another study, it was observed that orange juice significantly reduced the symptoms of depression. Fermented foods, fruits and vegetables, nuts, sauerkraut, yoghurt, cheese, coffee, red wine, turmeric, Mediterranean diet high intake of fruit, veg-

etables, legumes, nuts, olive oil and fish, low consumption of red meat, dairy products, saturated fat. It has been reported to increase beneficial bacteria in the microbiota and benefit mental health and cognition [1]. Ultra-processed foods, sugary drinks, snacks, foods made from refined substances, calorie-dense and rich in saturated fats, and added simple sugars, salt, and other additives have been shown to cause depression and other ill-health problems [1].

It has been observed that the direct application of probiotics to beneficial microbes in the microbiota-brain connection will have anxiolytic and antidepressive effects and may affect cognitive function. Probiotics show promise in curing anxiety, depression, and stress. Probiotics, prebiotics and fermented foods positively affect cognitive function. While the Mediterranean diet reduces the risk of developing depression and Alzheimer's, it also slows down cognitive decline. Poor dietary habits, so-called western diet, consumption of low-quality, processed, high-fat, high-sugar foods trigger poor mental health, impaired cognitive function, anxiety, depression, and other mental disorders [9]. Eating high-fat, high-sugar calorie diets cause negative changes in microbiota composition, increase of harmful bacteria, memory problems, poor cognitive flexibility [10].

#### Diet and mental health

It has been observed that probiotics have a positive effect on anxiety, depression, schizophrenia, bipolar disorder, autism spectrum disorder, neurobiological disorders such as Parkinson's, Alzheimer's, and improving cognitive function in the healthy population. In patients with psychiatric disorders, the severity of symptoms is related to the quality of the diet. It is said that antioxidant and B vitamins can be used in addition to antipsychotic drugs in schizophrenic patients to have a curative effect on psychotic symptoms, and diets rich in fruits and vegetables reduce depressive symptoms [11]. Sleep is an important physiological process that can affect physical and mental health. It is not only the central nervous system that initiates and maintains the process in

the sleep-wake cycle, but also affects signals from peripheral tissues. Increasing evidence indicates that the microbiota-gut-brain axis both directly and indirectly contributes to the regulation of sleep behavior and may play a critical role in the etiology and pathogenesis of sleep disorders [12]. Dietary prebiotics have helped to improve sleep quality by positively affecting the microbiota in sleep disorders caused by stress-related depression. Synbiotics are mixtures of probiotics and prebiotics. Symbiotics have been effective in regulating sleep problems that may be associated with altered melatonin metabolism in the gut microbiota. Postbiotics have been found to significantly improve sleep disturbance in chronically stressed students [12].

Recent studies have drawn attention to the role of gut microbiota and susceptibility genes in patients with major depressive disorder. It is thought that the gut microbiota may influence depressive symptoms, dietary thiamine intake may improve depressive symptoms, and cysteine has the potential to reverse cognitive deficits in depression [13,14].

In a study, it was seen that daily walnut consumption has a protective effect against the negative effects of academic stress on mental health. These protective effects are manifested by biomarkers that are reflected in stress, such as salivary  $\alpha$ -amylase. In this study, it was determined that daily walnut consumption in a female academician sample for 16 weeks eliminated the negative effects of stress on the gut microbiota [15]. The use of probiotics positively affects stress-related behavioral disorders and the interaction between the hypothalamic-pituitary-adrenal axis and the gut-brain-microbiota axes. Adequate and balanced nutrition and appropriate psychobiotic intake such as cheese, yoghurt, pickles, kefir, beer, and wine support the optimal level of neurological development [16].

#### Conclusion and recommendations

The regulation of the interaction between the gut and the brain through a healthy diet is important in the treatment of common mental disorders and in the prevention of disease. In recent years, studies have

focused on the use of food supplements with high prebiotic properties and microbiome-host interactions. As a result of these studies, it has been shown that the microbiota changes by changing the diet and this change influence both physical and mental health [15,12,13,16].

Microbiota-gut-brain axis, diet, mental health studies mainly include Mediterranean diet, plant-based diet, fruits and vegetables, unsaturated fatty acids, fermented foods, fiber and probiotics, vitamins beneficial for microbiota, western diet, animal-based protein, Foods containing saturated fatty acids sweetener are said to be harmful to the microbiota. Studies show that diet has a positive effect on neurobiological disorders such as anxiety, depression, schizophrenia, bipolar disorder, autism spectrum disorder, Parkinson's, and Alzheimer's [10,17].

By changing nutritional habits, microbiota can be changed, mental health can be protected and mental disorders that may occur can be prevented. Healthy eating habits can be emphasized by working on more food and patient groups in this area. It can reduce the symptoms of existing mental illnesses or prevent mental illnesses. Although it seems that many opportunities for health improvement lie in the microbiota, research on the creation of a healthy microbiota and personalized nutrition approaches needs to be increased.

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A – Concept and design of research, B – Collection and/or compilation of data, C – Analysis and interpretation of data, D -Statistical analysis, E – Writing an article, F – Search of the literature, G – Critical article analysis, H – Approval of the final version of the article, I – Acquisition of assets [eg financial]

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