

Association of depression and anxiety with nutrient intake across the lifespan: A Systematic Review of epidemiological studies

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The authors declare that they have no conflict of interest.

Outline of the Presentation

- Increasing global burden of mental illness
- Mental health and its complex risk factors
- Objectives and process of the current review
- Main findings of the review
- Take home messages/conclusion
- Challenges and way ahead

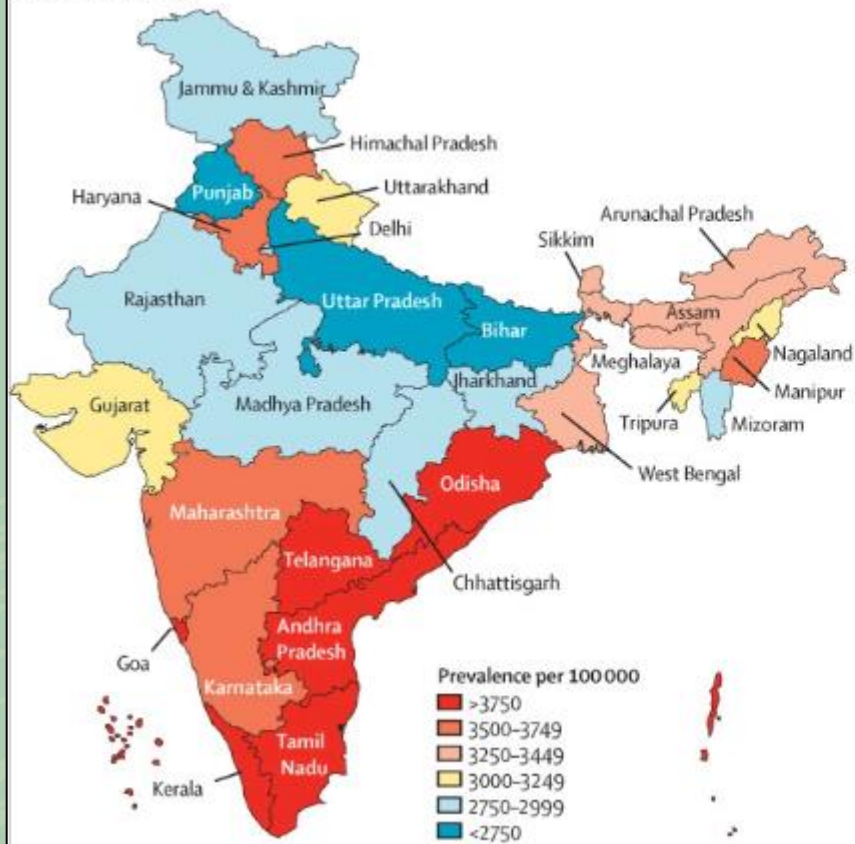
Burden of mental health disorders: another form of NCD

- Mental health disorders comprise a broad range of problems including a combination of abnormal thoughts, emotions, behaviour and relationship with others.
- Globally, 300 million people (equivalent to 4.4% of the world's population; from all ages groups) are estimated to suffer from depression and 264 million suffer from anxiety (3.6% of all age-groups) (WHO 2017).

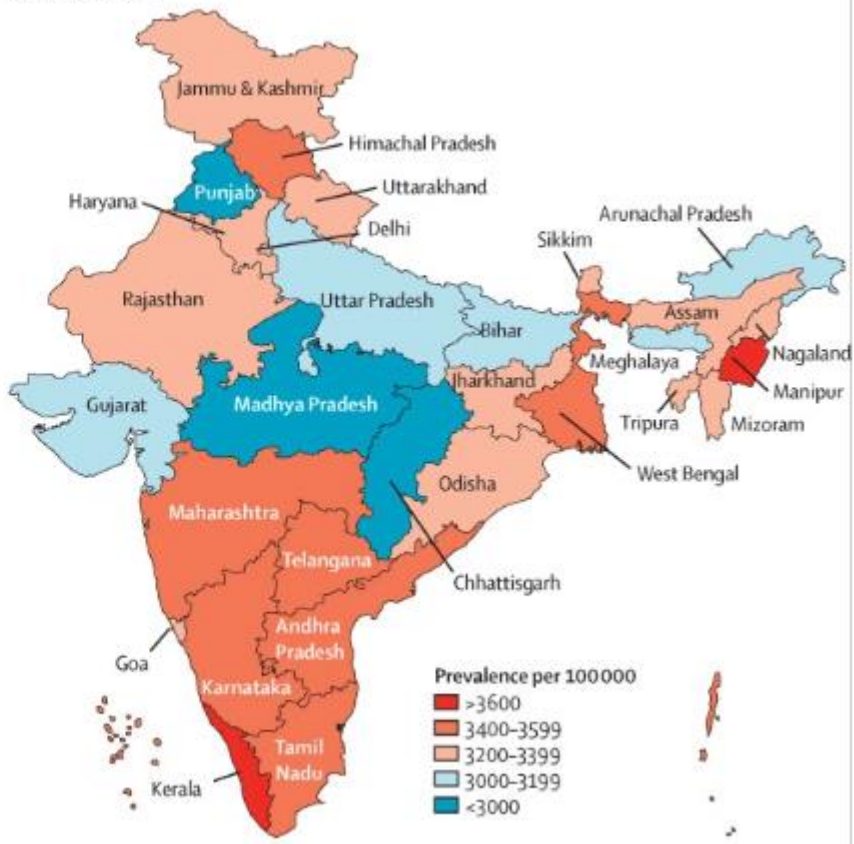
Problem in India

One in seven Indians is affected by mental disorders of varying severity. The contribution of mental disorders to the total disease burden in India has almost doubled since 1990. The problem is not only seen among adults but children and adolescents are also falling prey to these disorders.(National Mental health Survey, 2016).

Depressive disorders



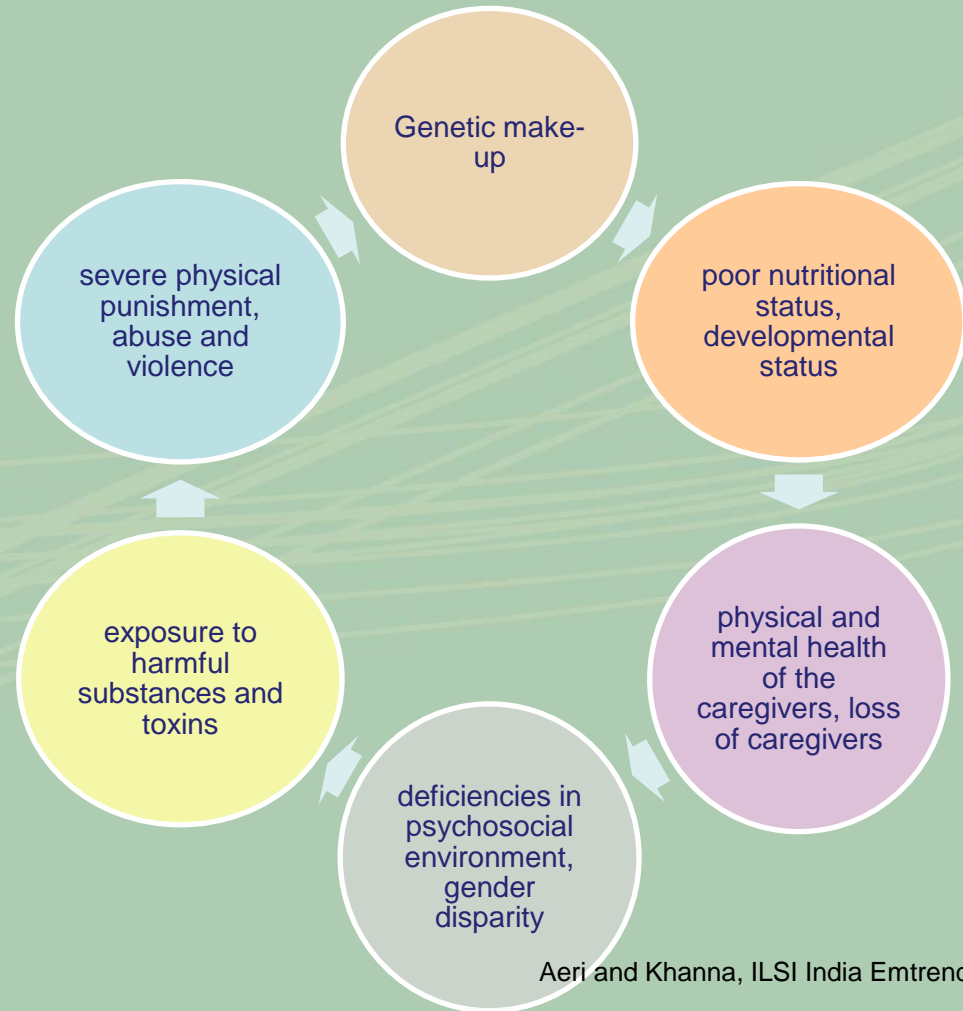
Anxiety disorders



Source: The burden of mental disorders across the states of India: the Global Burden of Disease Study 1990–2017, The Lancet Psychiatry, Feb 2020

Its complicated!

- genetic endowment and prenatal factors
- family relationships
- social circle and own thought processes
- self-perceptions
- stressful life events



Premise of the study

- Mental illness is not as stigmatized and more individuals are seeking help (hopefully!)
- Need to focus on making sure the brain is receiving adequate stimulation (nutrition) to promote normal brain development in a timely fashion.
- Through evidence of a positive impact on depression and anxiety symptoms through dietary changes, public health campaigns may be carried out to reduce the burden of mental health illness
- Assuming that mental health disorders are a form of NCDs, managing and preventing the risk factors (poor dietary lifestyle) may contribute in their control

METHODOLOGY



Research Objectives

The current systematic review was conducted to understand the relationship and interaction between nutrition and mental health across the lifespan.

To map evidence for preventive and treatment interventions in order to manage the diet related risk for mental health disorders

Data Collection

- The online systematic research included studies from January 2000 till September 2021.
- The PICOS - P=Participants with depressive/anxiety symptoms; I = Dietary Intervention; C= Comparator (exposure/intervention or no exposure/intervention); O= Outcomes (preventing or treatment of depression /anxiety); S= Study Design) model was used in this study.
- Review was registered with PROSPERO 2021 (CRD42021247306)
It is reported as per PRISMA checklist

Search strategy

- 6 electronic databases (PubMed, PsycInfo, Science Direct, MEDLINE, Scopus and Google Scholar).
- Relevant keywords and index terms “nutrition” or “diet*” or “dietary pattern” or “diet quality” or “food habits” or “nutrition surveys” or “diet surveys” or “food-frequency questionnaire” or “diet records” AND “depression” or “depressive disorder” or “anxiety disorder” or “affect*” or “mental health outcomes” or “depressive symptoms” or “anxiety symptoms” in combination with (and/or) cohorts, cross-sectional, clinical trials, interventions, randomized control trials, longitudinal studies will be used to extract articles.
- Additional publications were also identified from references cited in the original articles.

Inclusion criteria for selection of studies

Articles were included if they:

- examined wholesome diet (traditional diet, consisting of foods such as whole grains, legumes, fish, vegetables, fruits and nuts) and diet components
- included standardised measurements of assessing dietary components
- Included valid measures of mental health outcomes for depression, anxiety and psychological distress
- were conducted primarily on humans
- were published in English language

Exclusion criteria

Studies were
deemed
ineligible if they:

- included those with a chronic condition (e.g. CVD, T2DM, cancer, hypertension)
- Comprised of participants with eating disorders and

Screening and selection of studies

- Titles and abstracts of all articles were retrieved in the initial search.
- Articles which did not meet the eligibility (inclusion-exclusion) criteria were excluded.
- Additional studies from reference lists of relevant review articles identified and included.
- Full-text articles were retrieved if the citation was considered eligible, and was subjected to a second evaluation for relevance
- Quality of the studies checked by assessing the diet quality assessment using American Dietary Association Quality Criteria for primary research (2016) and European Micronutrient Recommendations Aligned Network of Excellence Scoring System (EURRECA, 2009)

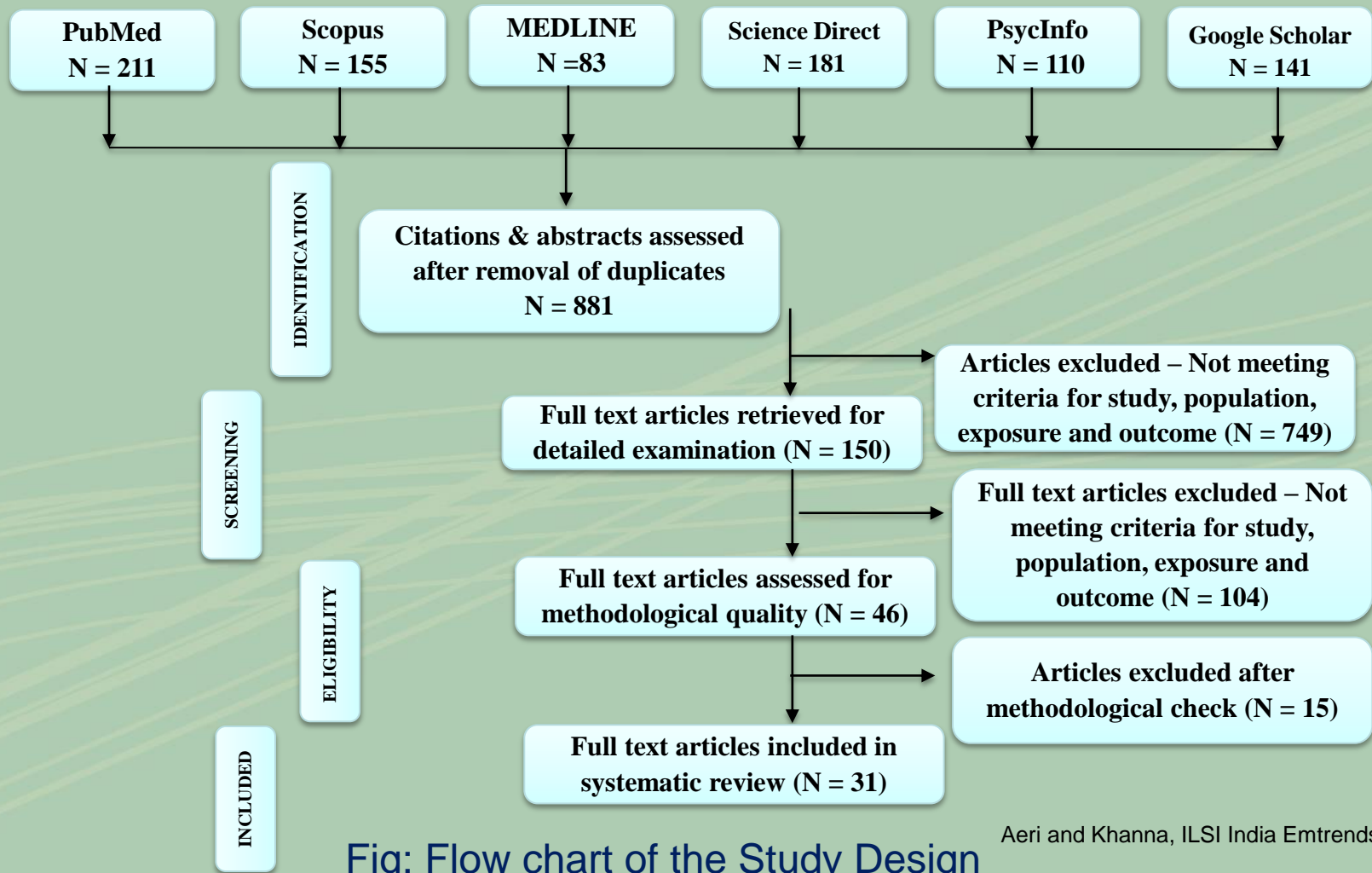


Fig: Flow chart of the Study Design

Data synthesis

The following information was extracted and tabulated in an excel sheet:

- author, publication year and country,
- study design, study duration (for cohort studies),
- sample size, number of cases and controls (if available),
- dietary assessment tool
- mental health assessment tool
- anthropometric assessment methods (if applicable), biochemical assessment (if applicable)
- statistical analysis and main findings.

RESULTS



Type of studies and Locale

Type of Study	No. of studies	Locale	No of studies
CROSS SECTIONAL	10	AUSTRALIA	10
LONGITUDINAL	5	JAPAN	4
RCTs	3	USA	2
COHORT/	9	SPAIN	2
PROSPECTIVE COHORT		INDIA/NEPAL/BANGLADESH	1
QUASI EXPERIMENTAL	1	IRELAND	1
Secondary Data Analysis	1	INDIA	1
Follow up	1	ENGLAND,SCOTLAND,WALES	1
Case control	1	SOUTH WEST ENGLAND	1
TOTAL	31	PERU	1
		LONDON	1
		INDIA/MEXICO/RUSSIA/SOUTHAFRIC	
		A/GHANA	1
		NETHERLANDS	1
		SWISS	1
		EUROPE COMBINED	1
		CANADA	1
		IRAN	1
		TOTAL	31

Details of Participants



The total number of participants ranged from 67 to 60,404 and comprised of:

- young children (6-18 months),
- early adolescents (11-13 years),
- adolescents (14-17 years),
- university students, young adults (18-30 years),
- pregnant women (singleton mother, 17 weeks of gestation),
- middle-aged adults (35-50 years) and
- older adults (55- 74 years).

Instruments to measure mental health

- Centre for Epidemiologic Studies Depression Scale (CESD)
- Child Behavior Checklist (CBCL)
- Patient Health Questionnaire (PHQ),
- Composite International Diagnostic Interview (CIDI-2 & Short Form)
- General Health Questionnaire (GHQ)
- Edinburg Postnatal Depression Scale (EPDS),
- PedsQL, Short Mood and Feelings Questionnaire
- Children's Depression Inventory, Youth Inventory, Kessler Psychological stress Scale (K 10), Montgomery-Asberg Depression rating Scale (MADRS),
- Beck Anxiety Inventory (BAI), Beck Depression Inventory (BDI)

Tools for assessing dietary intake

- Variations of a Food Frequency Questionnaire
- 24 hour recall
- Food Habits Questionnaire, Food Diary, Diet History Questionnaire, Food Records and Country specific and standardized fruit and vegetable list.
- Standardized diet related questions,
- Dietary diversity scores, minimum meal frequency value, minimum diet value,
- Food deprivation/household hunger scale
- Diet quality and adherence to regional food guide

Of the 31 studies, 27 studies explored the relationship between diet quality and mental health using diet as an exposure variable.

Components of diet like fruits and vegetables, fish, fried foods, PUFA's, diet quality

relationship of various nutrients

Adherence to regional dietary guidelines, prudent and western dietary patterns, Mediterranean diet, diet diversity, infant's feeding pattern

Body Mass Index (BMI) and weight status with mental health outcomes

4 studies explored the relationship between diet quality and mental health using mental health as the exposure variable i.e. poor mental health and its association with

low adherence to Mediterranean diet pattern (including vegetables, cereals, olive oil)

low fruit consumption (less than 5 servings a day)

increased consumption of sweet foods and sweet drinks in infants

- Due to heterogeneity in the tools used for assessment of dietary intake and mental health outcomes, meta-analysis could not be performed.
- Hence a narrative synthesis analysis was performed

MAIN FINDINGS

Adherence to dietary recommendations

High adherence to regional dietary recommendations showed a protective effect against depression

High intake of fruits, vegetables, fiber, fish, low fat dairy, unsaturated fats reduced depression risk

► *Am J Epidemiol.* 2014 May 15;179(10):1228-35. doi: 10.1093/aje/kwu050. Epub 2014 Apr 15.

Longitudinal associations between fish consumption and depression in young adults

Kylie J Smith, Kristy Sanderson, Sarah A McNaughton, Seana L Gall, Terry Dwyer, Alison J

► *BMC Psychiatry.* 2017 Jan 14;17(1):15. doi: 10.1186/s12888-017-1198-1.

Association between depression and fruit and vegetable consumption among adults in South

Ghose Bishwajit^{1,2}, Daniel Peter O'Leary³, Sharmistha Ghosh⁴, Yaya Sanni⁵, Tang Sh Feng Zhanchun⁶

► *Public Health Nutr.* 2015 Feb;18(3):546-53. doi: 10.1017/S1368980014000561. Epub

Unsaturated fat intakes and mental health outcomes in young women from the Australian Longitudinal Study on Women's Health

Clare Daley¹, Amanda Patterson¹, David Sibbritt², Lesley MacDonald-Wicks¹

European Journal of Nutrition
https://doi.org/10.1007/s00394-019-01943-4

ORIGINAL CONTRIBUTION

Association of food groups with depression and anxiety disorders

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Abstract

Purpose Adherence to the Mediterranean diet has been associated with fewer depressive symptoms, however, it is unknown whether this is attributed to some or to all components. We examined the association between the individual food groups of the Mediterranean Diet Score (MDS), in isolation and in combination, with depression and anxiety (symptom severity and diagnosis).

Methods Data from 1634 adults were available from the Netherlands Study of Depression and Anxiety. Eleven energy-adjusted food groups were created from a 238-item food frequency questionnaire. In regression analysis, these were associated in isolation and combination with (1) depressive and anxiety disorders (established with the Composite International Diagnostic Interview) (current disorder) ($n = 414$), and (2) depression and anxiety severity (measured with the Inventory of Depressive Symptomatology (IDS), the Beck Anxiety Inventory (BAI) and the Fear Questionnaire (FEAR)).

Results Overall, the MDS score shows the strongest relationships with depression/anxiety (Diagnosis: odds ratio (OR) 0.77 per SD, 95% confidence interval (95% CI) 0.66–0.90, IDS: standardized beta (β) -0.13 , 95% CI -0.18 , -0.08) and anxiety (BAI: β -0.11 , 95% CI -0.16 , -0.06 , FEAR: β -0.08 , 95% CI -0.13 , -0.03). Greater consumption of non-refined grains and vegetables was associated with lower depression and anxiety severity, whilst being a non-drinker was associated with higher symptom severity. Higher fruit and vegetable intake was associated with lower fear severity. Non-refined grain consumption was associated with lower odds and being a non-drinker with greater odds of current depression/anxiety disorders compared to healthy controls; these associations persisted after adjustment for other food groups (OR 0.82 per SD, 95% CI 0.71–0.96, OR 1.26 per SD, 95% CI 1.06–1.46).

Conclusion We can conclude that non-refined grains, vegetables and alcohol intake appeared to be the driving variables for the associated the total MDS score and depression/anxiety. However, the combined effect of the whole diet remains important for mental health. It should be explored whether an increase consumption of non-refined grains and vegetables may help to prevent or reduce depression and anxiety.

Keywords Mediterranean diet · Depression · Anxiety · Diet quality

Electronic supplementary material The online version of this article (<https://doi.org/10.1007/s00394-019-01943-4>) contains supplementary material, which is available to authorized users.

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Introduction

The 2013 Global Burden of Disease report identified that, in both developing and developed countries, major depressive disorder (MDD) now ranks as the second highest cause of years of life lost due to disability (YLLD) [1]. Depression is an important public health problem and is estimated to affect more than 300 million people worldwide [2]. Furthermore, depression is frequently comorbid with anxiety disorders [3] which also represents a large burden to society as it is the sixth leading cause of disability in terms of YLLD [4].

There are indications that a healthy diet may play a protective role in the development, progression and treatment

Relationship of fruit and vegetable intake, health behaviours and depression

Increased fruit and vegetable consumption associated with reduced psychological distress, but a threshold effect at high levels of fruit intake was seen suggesting that higher than 7 servings of fruits and vegetables may not confer additional benefits

Mental health
Research

Fruit and vegetable consumption and psychological distress: cross-sectional and longitudinal analyses based on a large Australian sample



Binh Nguyen, Ding Ding, Seema Mhrshahi

Correspondence to Ms Binh Nguyen; thanh-binh.nguyen-duy@sydney.edu.au

> *J Epidemiol Community Health*. 2016 Feb;70(2):155-61. doi: 10.1136/jech-2015-205858. Epub 2015 Aug 26.

Associations between fruit and vegetable consumption and depressive symptoms: evidence from a national Canadian longitudinal survey

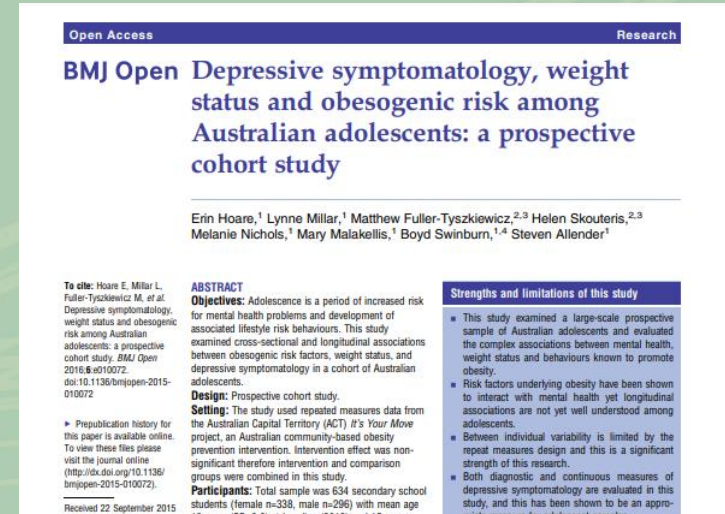
Mila Kingsbury ¹, Gabrielle Dupuis ¹, Felice Jacka ², Marie-Hélène Roy-Gagnon ¹, Seanna E McMartin ¹, Ian Colman ¹

Associations of fruit and veg intake and indicators of depression were attenuated after adjustment for social support, physical activity and no smoking

Aeri and Khanna, ILSI India Emtrends, Oct 2022

Negative impact of diet

High consumption of sweet drinks, confectionary foods, take away foods, fatty foods, red meat was shown to be associated with increased levels of depressive symptomatology



► *Brain Behav Immun.* 2018 Mar;69:428-439. doi: 10.1016/j.bbi.2018.01.002. Epub 2018 Jan 12.

Dietary patterns, body mass index and inflammation: Pathways to depression and mental health problems in adolescents

Wendy H Oddy¹, Karina L Allen², Georgina S A Trapp³, Gina L Ambrosini³, Lucinda J Black⁴, Rae-Chi Huang⁵, Peter Rzehak⁶, Kevin C Runions⁵, Feng Pan⁷, Lawrence J Beilin⁸, Trevor A Mori⁸

Pro-inflammatory diet and depression

- Sweets, refined foods, high fat foods, red and processed meats impact systemic inflammation.
- Higher risk of depression in women, middle aged adults and overweight and obese persons.
- Most of the consumers of these diets were also smokers and had low physical activity

Micronutrient intake and risk of depression

- Dietary intake of Zn and Mg was inversely associated with depression and anxiety in women
- Intake of vitamin B12 and folic acid was inversely associated
- High processed food intake is associated with lower MN intake and results in inflammation

➤ [J Affect Disord.](#) 2012 Dec 1;141(1):79-85. doi: 10.1016/j.jad.2012.02.018. Epub 2012 Mar 6.

Nutrient intakes and the common mental disorders in women

Felice N Jacka ¹, Michael Maes, Julie A Pasco, Lana J Williams, Michael Berk

Dietary choice and practices

Prevalence of depression was highest among vegans (28%) as compared to omnivores (16%) (Matta J et al, *Nutrients*, 10(11), 2018:1695)

Dietary glycemic index was linked to depression in post menopausal women (Gangwisch et al, *AJCN*, 2015, 102(2): 454-63)

Consuming fish more than once a week was associated with lower depressive symptoms (Smith et al, *American Journal of Epidemiology*, 179(10), 2014: 1228–1235)

Eating breakfast at home, carrying lunch, 2 serves of fruits and 4 of vegetables were positively linked to mental health (Jacka et al, *Plos One*, 2011;6(9):e24805.)

INTERVENTIONS SUPPORTING LINK BETWEEN DIET AND DEPRESSION

RESEARCH ARTICLE

A brief diet intervention can reduce symptoms of depression in young adults – A randomised controlled trial

Heather M. Francis^{1*}, Richard J. Stevenson¹, Jaime R. Chambers^{2,3}, Dolly Gupta¹, Brooklyn Newey¹, Chal K. Lim⁴

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Abstract

There is strong epidemiological evidence that poor diet is associated with depression. The reverse has also been shown, namely that eating a healthy diet rich in fruit, vegetables, fish and lean meat, is associated with reduced risk of depression. To date, only one randomised controlled trial (RCT) has been conducted with elevated depression symptoms being an inclusion criterion, with results showing that a diet intervention can reduce clinical levels of depression. No such RCTs have been performed in young adults. Young adults with elevated levels of depression symptoms and who habitually consume a poor diet were randomly allocated to a brief 3-week diet intervention (Diet Group) or a habitual diet control group (Control Group). The primary and secondary outcome measures assessed at baseline and after the intervention included symptoms of depression (Centre for Epidemiological Studies Depression Scale; CES-D-R; and Depression Anxiety and Stress Scale–21 depression subscale; DASS-21-D), current mood (Profile of Mood States), self-efficacy (New General Self-Efficacy Scale) and memory (Hopkins Verbal Learning Test). Diet compliance was measured via self-report questionnaires and spectrophotometry. One-hundred-and-one individuals were enrolled in the study and randomly assigned to the Diet Group or the Control Group. Upon completion of the study, there was complete data for 38 individuals in each group. There was good compliance with the diet intervention recommendations assessed using self-report and spectrophotometry. The Diet group had significantly lower self-reported depression symptoms than the Control Group on the CES-D-R ($p = 0.007$, Cohen's $d = 0.65$) and DASS-21 depression subscale ($p = 0.002$, Cohen's $d = 0.75$) controlling for baseline scores on these scales. Reduced DASS-21 depression subscale scores were maintained on follow up phone call 3 months later ($p = .009$). These results are the first to show that young adults with elevated depression symptoms can engage in and adhere to a diet intervention, and that this can reduce symptoms of depression. The findings provide justification for future research into the duration of these benefits, the impacts of varying diet composition, and their biological basis.

OPEN ACCESS

Citation: Francis HM, Stevenson RJ, Chambers JR, Gupta D, Newey B, Lim CK (2019) A brief diet intervention can reduce symptoms of depression in young adults – A randomised controlled trial. PLoS ONE 14(10): e0222768. <https://doi.org/10.1371/journal.pone.0222768>

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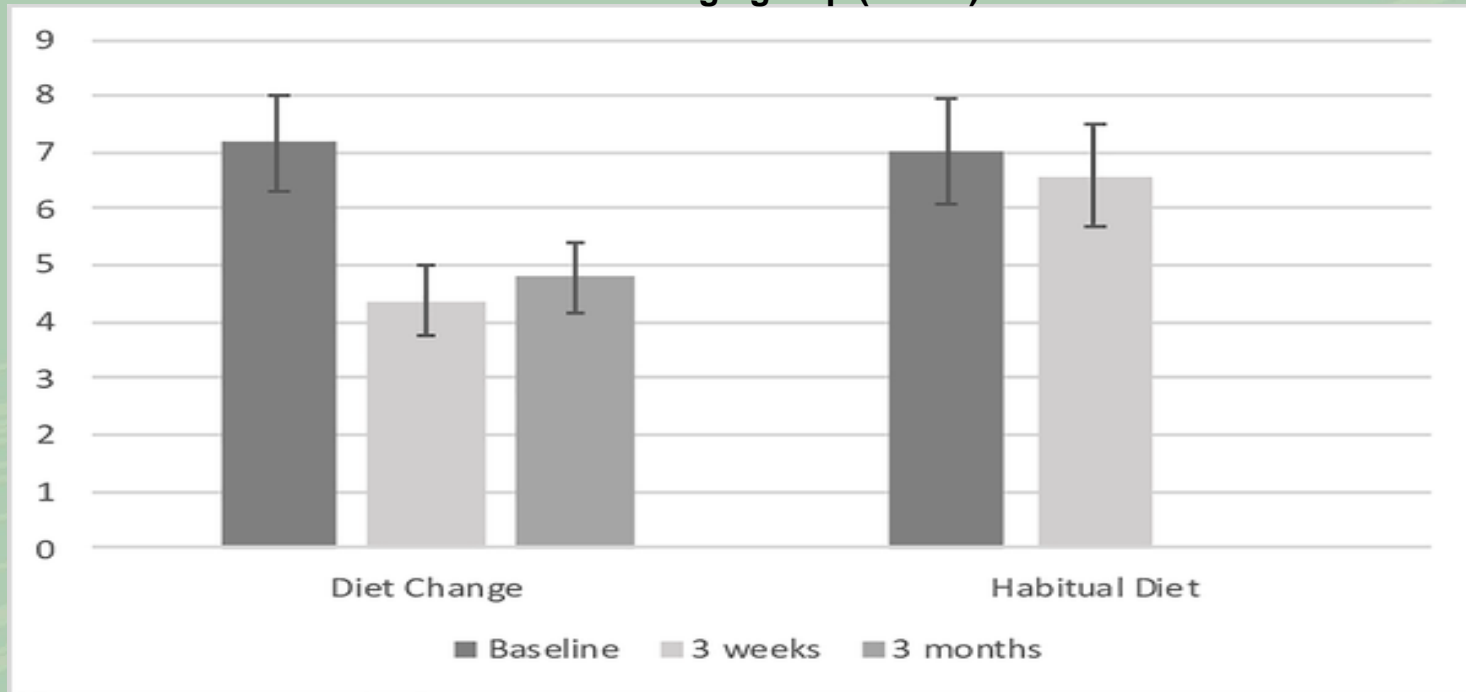
Data Availability Statement: All relevant data are within the manuscript and its Supporting Information files.

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Competing interests: The authors have declared that no competing interests exist.

These results indicated that young adults with elevated depression symptoms adhered to a diet intervention, and that experienced reduced symptoms of depression.

Fig : DASS-21 Depression subscale scores for diet change (n = 38) group were significantly lower than the habitual diet (n = 38) group following 3 weeks of diet improvement, controlling for baseline scores (effect size: Cohen's d = 0.65) and remained significantly lower than baseline at 3 month follow up for the diet change group (n = 33).



Francis HM, Stevenson RJ, Chambers JR, Gupta D, Newey B, et al. (2019) A brief diet intervention can reduce symptoms of depression in young adults – A randomised controlled trial. PLOS ONE 14(10): e0222768. <https://doi.org/10.1371/journal.pone.0222768>

<https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0222768>

RESEARCH ARTICLE

Open Access



A randomised controlled trial of dietary improvement for adults with major depression (the 'SMILES' trial)

Felice N. Jacka^{1,4,9,10,11*}, Adrienne O'Neill^{1,2,13}, Rachelle Ople^{1,13}, Catherine Itsiopoulos⁵, Sue Cotton⁹, Mohammedreza Mohebbi¹, David Castle^{4,11}, Sarah Dash^{1,13}, Catherine Mihalopoulos², Mary Lou Chatterton², Laima Brazionis^{5,6}, Olivia M. Dean^{1,4,12,13}, Allison M. Hodge⁸ and Michael Berk^{1,2,12,13}

Abstract

Background: The possible therapeutic impact of dietary changes on existing mental illness is largely unknown. Using a randomised controlled trial design, we aimed to investigate the efficacy of a dietary improvement program for the treatment of major depressive episodes.

Methods: 'SMILES' was a 12-week, parallel-group, single blind, randomised controlled trial of an adjunctive dietary intervention in the treatment of moderate to severe depression. The intervention consisted of seven individual nutritional consulting sessions delivered by a clinical dietitian. The control condition comprised a social support protocol to the same visit schedule and length. Depression symptomatology was the primary endpoint, assessed using the Montgomery-Åsberg Depression Rating Scale (MADRS) at 12 weeks. Secondary outcomes included remission and change of symptoms, mood and anxiety. Analyses utilised a likelihood-based mixed-effects model repeated measures (MMRM) approach. The robustness of estimates was investigated through sensitivity analyses.

Results: We assessed 166 individuals for eligibility, of whom 67 were enrolled (diet intervention, $n = 33$; control, $n = 34$). Of these, 55 were utilising some form of therapy: 21 were using psychotherapy and pharmacotherapy combined; 9 were using exclusively psychotherapy; and 25 were using only pharmacotherapy. There were 31 in the diet support group and 25 in the social support control group who had complete data at 12 weeks. The dietary support group demonstrated significantly greater improvement between baseline and 12 weeks on the MADRS than the social support control group, 160.7 ± 4.38 , $p < 0.001$. Cohen's $d = -1.16$. Remission, defined as a MADRS score < 10 , was achieved for 32.3% ($n = 10$) and 8.0% ($n = 2$) of the intervention and control groups, respectively ($\chi^2 (1) = 4.84$, $p = 0.028$); number needed to treat (NNT) based on remission scores was 4.1 (95% CI of NNT 2.3–27.8). A sensitivity analysis, testing departures from the missing at random (MAR) assumption for dropouts, indicated that the impact of the intervention was robust to violations of MAR assumptions.

Conclusions: These results indicate that dietary improvement may provide an efficacious and accessible treatment strategy for the management of this highly prevalent mental disorder, the benefits of which could extend to the management of common co-morbidities.

Trial registration: Australia and New Zealand Clinical Trials Register (ANZCTR): ACTRN12612000251820. Registered on 29 February 2012.

Keywords: Depression, Major depressive disorder, Diet, Nutrition, Randomised controlled trial, Dietetics

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Diet and mental health – SMILES trial

- 67 patients with moderate to severe depression
- RCT comparing diet changes to social support for 12 weeks

Results:

- Significant reduction in depression scoring scale (MADRS) in diet group compared to control
- Depression remission in 32% of diet group compared to 8% in control ($p=0.028$)

Principles ModiMed diet

Daily (serves)

Whole grains (5-8)
Vegetables (6)
Fruit (3)
Low fat/low sugar dairy (2-3)
Nuts (1)
Olive oil (3 Tbsp)

Weekly (serves)

Legumes (3-4)
Fish (2)
Lean red meat (3-4)
Chicken (2-3)
Eggs (<7)

STUDIES WHICH DID NOT SUPPORT THE LINK BETWEEN DIET AND DEPRESSION

Randomized Controlled Trial > JAMA. 2019 Mar 5;321(9):858-868. doi: 10.1001/jama.2019.0556.

Effect of Multinutrient Supplementation and Food-Related Behavioral Activation Therapy on Prevention of Major Depressive Disorder Among Overweight or Obese Adults With Subsyndromal Depressive Symptoms: The MoodFOOD Randomized Clinical Trial

Mariska Bot¹, Ingeborg A Brouwer², Miquel Roca³, Elisabeth Kohls⁴, Brenda W J H Penninx¹, Ed Watkins⁵, Gerard van Grootheest¹, Mieke Cabout², Ulrich Hegerl⁴, Margalida Gili³, Matthew Owens⁵, Marjolein Visser², MoodFOOD Prevention Trial Investigators

Affiliations + expand

PMID: 30835307 PMID: [PMC6439597](#) DOI: [10.1001/jama.2019.0556](#)

[Free PMC article](#)

Among overweight or obese adults with sub-syndromal depressive symptoms, multi-nutrient supplementation compared with placebo and food-related behavioral activation therapy compared with no therapy did not reduce episodes of major depressive disorder during 1 year. These findings do not support the use of these interventions for prevention of major depressive disorder.

A prospective investigation of dietary patterns and internalizing and externalizing mental health problems in adolescents

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Keywords

Adolescence, diet, externalizing behaviors, mental health, nutrition, raine Study

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Food Science & Nutrition 2016; 4(6): 888–896

doi: 10.1002/fsn3.355

Abstract

Investigating protective and risk factors that influence mental health in young people is a high priority. While previous cross-sectional studies have reported associations between diet and mental health among adolescents, few prospective studies exist. The aim of this study was to examine prospective relationships between dietary patterns and mental health among adolescents participating in the Western Australian Pregnancy Cohort (Raine) Study. Self-report questionnaires were used to assess indicators of mental health (Youth Self-Report externalizing/internalizing T-scores) and Western and Healthy dietary patterns (identified using factor analysis) at 14 (2003–2005) and 17 years (2006–2008). Multivariate linear and logistic regression were used to assess relationships between dietary patterns and mental health. Complete data were available for 746 adolescents. In females only, the Western dietary pattern z-score at 14 years was positively associated with greater externalizing behaviors at 17 years ($\beta = 1.91$; 95% CI: 0.04, 3.78) and a greater odds of having clinically concerning externalizing behaviors at 17 years (OR = 1.90; 95% CI: 1.06, 3.41). No other statistically significant associations were observed. Overall our findings only lend partial support to a link between diet and mental health. We found it to be specific to females consuming a Western dietary pattern and to externalizing behaviors. Future research on dietary patterns and mental health needs to consider possible sex differences and distinguish between different mental health outcomes as well as between healthy and unhealthy dietary patterns.

Introduction

Mental health disorders account for nearly a quarter of the world's disability burden (Vos et al. 2013). These disorders include both internalizing problems, such as depression and anxiety, and externalizing problems, such as conduct disorders and attention deficit hyperactivity disorder and may be viewed as occurring on a continuum from normal behavior to problems that warrant a clinical

diagnosis. The majority of mental health problems first manifest before adulthood, with marked increases in prevalence between the ages of 16 and 24 years (Jones 2013). Moreover, there is some evidence that the prevalence of mental health problems among young people is increasing with recent estimates suggesting that more than one in four young adults meet the criteria for at least one mental health disorder (Twenge et al. 2010). Adolescence represents a critical period of biological change, rapid growth,

Dietary intervention was found to be specific to females consuming a Western dietary pattern and to externalizing behaviors. No associations were seen for internalising behaviours.

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Diet quality and depression risk in a Japanese population: the Japan Public Health Center (JPHC)-based Prospective Study

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The association of overall diet quality based on the Japanese Food Guide Spinning Top with risk of depression is not known. This prospective cohort study aimed to determine whether higher adherence to the Japanese food guide reduced the risk of depression. Of 12,219 residents enrolled at baseline, we extracted 1,112 participants who completed a 5-year follow-up (1995) and participated in a mental health screening (2014–2015). Diet quality was scored based on adherence to the Japanese food guide and the ratio of white to red meat according to the Alternative Healthy Index and ranged from 0 (worst) to 80 (best). We calculated odds ratios and 95% confidence intervals for current psychiatrist-diagnosed depression per quartile of total score and of eight component scores with the lowest quartile as reference. Mean age of the participants was 73 years and 59% were women. Total diet quality score was not significantly associated with risk of depression 20 years after the baseline assessment. Among the eight components on the diet quality score, there was a significantly reduced risk for the highest quartile of the white to red meat ratio score. In conclusion, our results do not indicate that higher adherence to the Japanese food guide prevents depression.

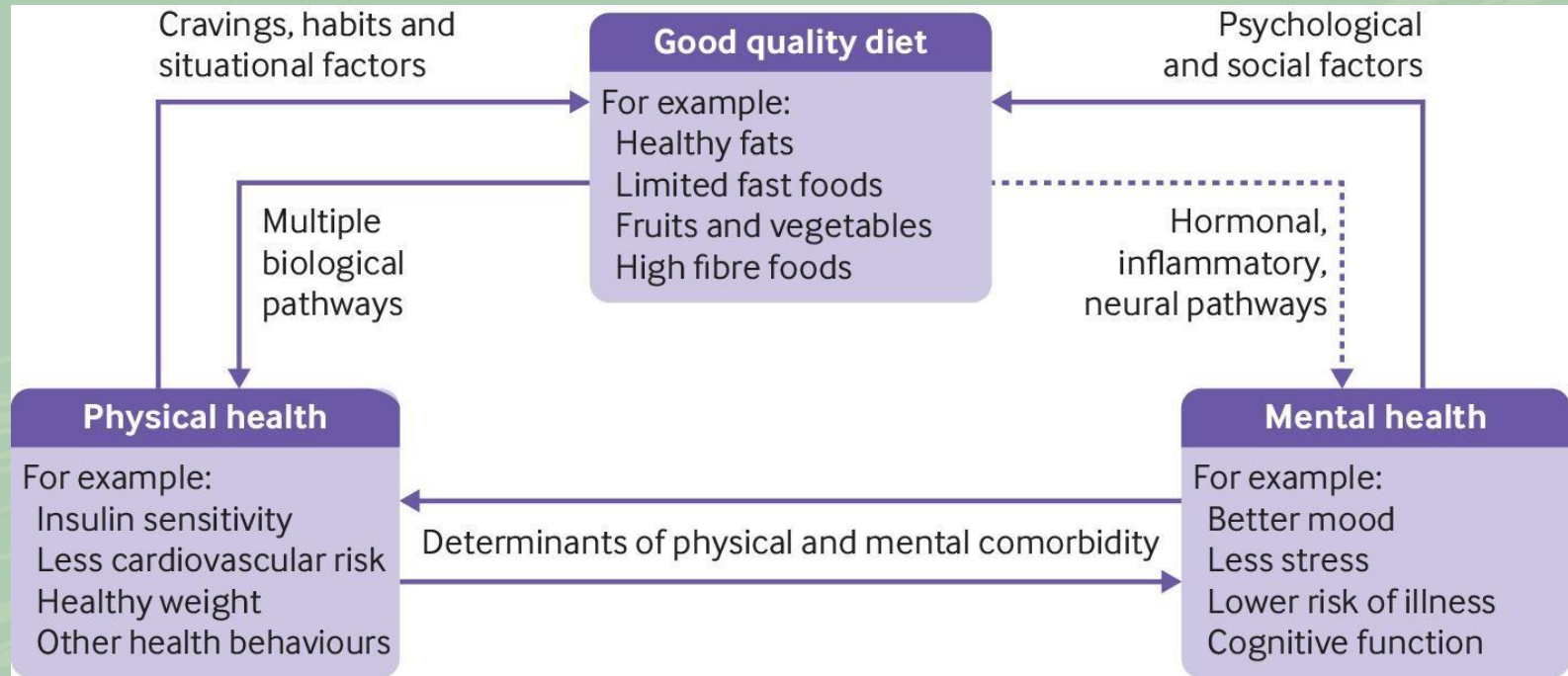
Extensive research indicates that diet is one of the biggest risk factors for non-communicable diseases (NCDs)^{1–3}. Therefore, for prevention of NCDs, several countries have introduced their own dietary recommendations or guidelines that consider their population's eating habits. In Japan, the Ministry of Health, Labour, and Welfare and the Ministry of Agriculture, Forestry and Fisheries jointly developed the Japanese Food Guide Spinning Top to emphasize the optimal balance and quantity of food in the daily Japanese diet. In 2016, Kurotani *et al.*⁴ found that a higher overall diet quality score was associated with a lower risk of mortality via a large-scale prospective cohort study (N = 79,594) assessing diet quality based on adherence to the Japanese food guide in 11 Japanese regions. For the influence of diet on depression, several mechanisms have been proposed based on animal studies and observational studies in humans, such as the gut microbiota⁵, inflammatory signaling⁶, and the hypothalamic–pituitary–adrenal (HPA) axis¹⁰. However, the association between diet quality and depression has remained unclear.

A recent cross-sectional study reported that a higher overall quality score based on adherence to the Japanese food guide was associated with lower risk of self-reported depressive symptoms in young and middle-aged women¹¹. Although a recent meta-analysis of 24 independent cohorts (totaling 1,959,217 person-years) also reported that higher diet quality, regardless of type, was associated with a lower risk of depressive symptoms¹², there was no effect of diet quality on depression in studies using a formal diagnosis as an outcome^{12–15} or when there was a control for depressive symptoms at baseline⁶. Furthermore, to our knowledge, no prospective study has examined the influence of diet quality on the risk of depression formally diagnosed by a psychiatrist.

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Higher diet quality score was not associated with clinical depression among adults followed up for 5 years

Link between Diet quality and Mental health



RECHARGING BRAIN HEALTH

- Brain is a chemical factory that produces Acetylcholine, Dopamine, Serotonin, Gamma Amino Butyric Acid (G.A.B.A.), Norepinephrine, Epinephrine etc.
- The only raw materials for their syntheses are nutrients.
- Improper or insufficient amounts of key nutrient building blocks, may cause serious problems with neurotransmitters

The **gut-brain axis** (GBA) consists of bidirectional communication between the central and the enteric nervous system, linking emotional and cognitive centers of the **brain** with peripheral **intestinal** functions. Recent advances in research have described the importance of **gut** microbiota in influencing these interactions.

Conclusions

- Diet can be important contributory factor in the emergence of mental health problems.
- High diet quality is supportive of mental well-being and appears to be a feasible strategy in prevention of adverse mental health.
- Epidemiological data do not provide information about causality
- The mechanisms of action/pathways associating diet with health outcomes are complex.
- These may include modulation of pathways involved in inflammation, oxidative stress, epigenetics, mitochondrial dysfunction, the gut microbiota and obesity.

Challenges and work required in future

- Challenge is to conduct intervention studies that assess markers related to MH pathways within clinically diagnosed individuals.
- Confirmation of a causal relationship between diet quality and mental health by well planned RCT's will help in formulating targeted therapeutic intervention approaches
- Physical activity, weight management may also be encouraged
- Data from India regarding managing mental health through dietary interventions is lacking. Considering mental health to be another form of NCD, guidelines for management need to be formulated based on well designed RCT's



THANK YOU!