

Review Article



Relationship Between Energy, Fat, and Carbohydrate Consumption Habits in Pregnant Women Chronic Energy Deficiency during the COVID-19 Pandemic: A Systematic Review

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ABSTRACT

Background: Chronic Energy Deficiency (CED) during the COVID-19 pandemic has an impact on pregnant women's nutritional status. The size of LiLA 23.5 cm indicates CED. The goal of this study is to improve the nutritional status of pregnant women suffering from chronic energy deficiency.

Method: A systematic review of relevant articles from databases (Pubmed, ScienceDirect, and Google Scholar) using keywords in Indonesian and English was used in the study. The following inclusion criteria were used to select nine articles: publication from 2017 to 2021, discussion of food consumption habits in pregnant women, articles in English or Indonesian, full text, open access, and scientific journals.

Results: The findings of this study can be used to assess the consumption habits of pregnant women who have CED as a result of insufficient food intake and a lack of variety in their diet. Low family income, human resources, education, and a lack of family support led to less food consumption habits in pregnant women.

Conclusion: The study concludes that adequate food intake and good human resource consumption habits can affect the nutritional status of pregnant women.

Keywords: Energy consumption habit; Fat consumption habit; Carbohydrate consumption habit; Pregnant women; Chronic Energy Deficiency



INTRODUCTION

Maternal mortality in developing countries can reach 40%, with chronic energy deficiency being one of the causes.¹ Maternal mortality is directly caused by bleeding, infection, and eclampsia. Chronic energy deficiency causes maternal mortality indirectly.² The Maternal Mortality Rate (MMR) ratio will be reduced to 70 per 100,000 live births by 2030, according to the Sustainable Development Goals. According to Basic Health Research, the prevalence of CED in pregnant women was 17.3% in 2018.³

Regulation Minister of Health of the Republic of Indonesia No. 97 of 2014 describes the examination of pregnant women's nutritional status by measuring the upper arm circumference, with the goal of detecting chronic energy deficiency (CED). CED occurs in pregnant women for an extended period of time due to insufficient food intake, with a significant upper arm circumference of 23.5 cm.⁴ Macro and micronutrient deficiencies are direct causes of chronic energy deficiency in pregnant women. Knowledge, antenatal care visits, occupation, family income, attitude, maternal age, parity, and environmental health are all indirect causes.^{5,6}

Food consumption and the use of less diverse ingredients can have an impact on pregnant women's nutritional problems and chronic energy deficiency.^{7,8} Beginning during pregnancy, a well-balanced nutritional intake is required for brain development and physical growth.⁹ Energy, protein, fat, and carbohydrates are macronutrients that contribute to nutrient intake.¹⁰ According to Regulation Minister of Health, Republic of Indonesia No. 28 of 2019, each trimester recommends nutrients in additional energy for pregnant women who require 180, 300, and 300 kcal/day. Pregnant women require 1, 10, and 30 grams of protein per day. Pregnant women gain 2.3 grams of fat per day and 25, 40, and 40 grams of carbohydrates per day.¹¹

The government declared the COVID-19 Public Health Emergency in Presidential Decree Number 11 of 2020. Because of government regulations governing large-scale social restrictions, community access has been limited. The COVID-19 pandemic causes low macronutrient consumption, limiting access to food nutrition. The COVID-19 pandemic has had an impact on low-income families, reducing their purchasing power for food nutrition.¹² Meanwhile, prior to the COVID-19 pandemic, all food-related activities were free of charge. This study looked at the relationship between pregnant women's eating habits and the occurrence of chronic energy deficiency during COVID-19.

METHOD

This study analyzed the relationship between energy, fat, and carbohydrate consumption habits in pregnant women with chronic energy deficiency. This research used *Systematic Review* using PISMA guideline, a literature review method with several characteristics such as a precise formulation of research questions, specific inclusion and exclusion, and systematic and transparent reporting.¹³

Search methods

The articles were found using keywords in three databases: PubMed (<https://pubmed.ncbi.nlm.nih.gov/>), Google Scholar (<https://scholar.google.com/>), and ScienceDirect (<https://www.sciencedirect.com/>). The keywords used are "consumption habits", "eating habits", "food intake", "pregnant women" and "chronic energy deficiency". For relevant articles, the title, keyword, abstract, language, and year of publication were screened in the first stage. The second stage involved screening articles based on the corresponding variable, and the final stage involved selecting papers based on the full text. During the keyword search, nine articles were found that discussed the relationship between pregnant women's consumption habits and chronic energy deficiency.

Study selection

The study's inclusion criteria were health articles from 2017 to 2021 discussing pregnant eating habits, articles in English or Indonesia, full text and accessibility, and scientific articles.

This study excludes studies such as reviews, case reports, editorials, commentaries, perspectives, and articles with methodological flaws from its analysis of adolescents with chronic energy deficiency.

The PCO table is created using a systematic review method to identify the independent and dependent variables. PCOs are structured to determine keywords for literature searches based on the population (P), context (C), and outcome (O). Steps, writing, protocols, and research were among the keywords used to search the literature.¹⁴

The PCO of energy, fat, and carbohydrate consumption habits in pregnant women with chronic energy deficiency was used in Table 1.

Table 1. Search term (keyword) used in this research

PCO	Search Term
Population	Pregnant women
Context	Food consumption habits, food intake, eating habits
Outcome	Nutritional status of pregnant women, chronic energy deficiency

RESULTS

The PRISMA method for reviewing article search results in the PubMed, Google Scholar, and ScienceDirect databases is depicted in Figure 1.

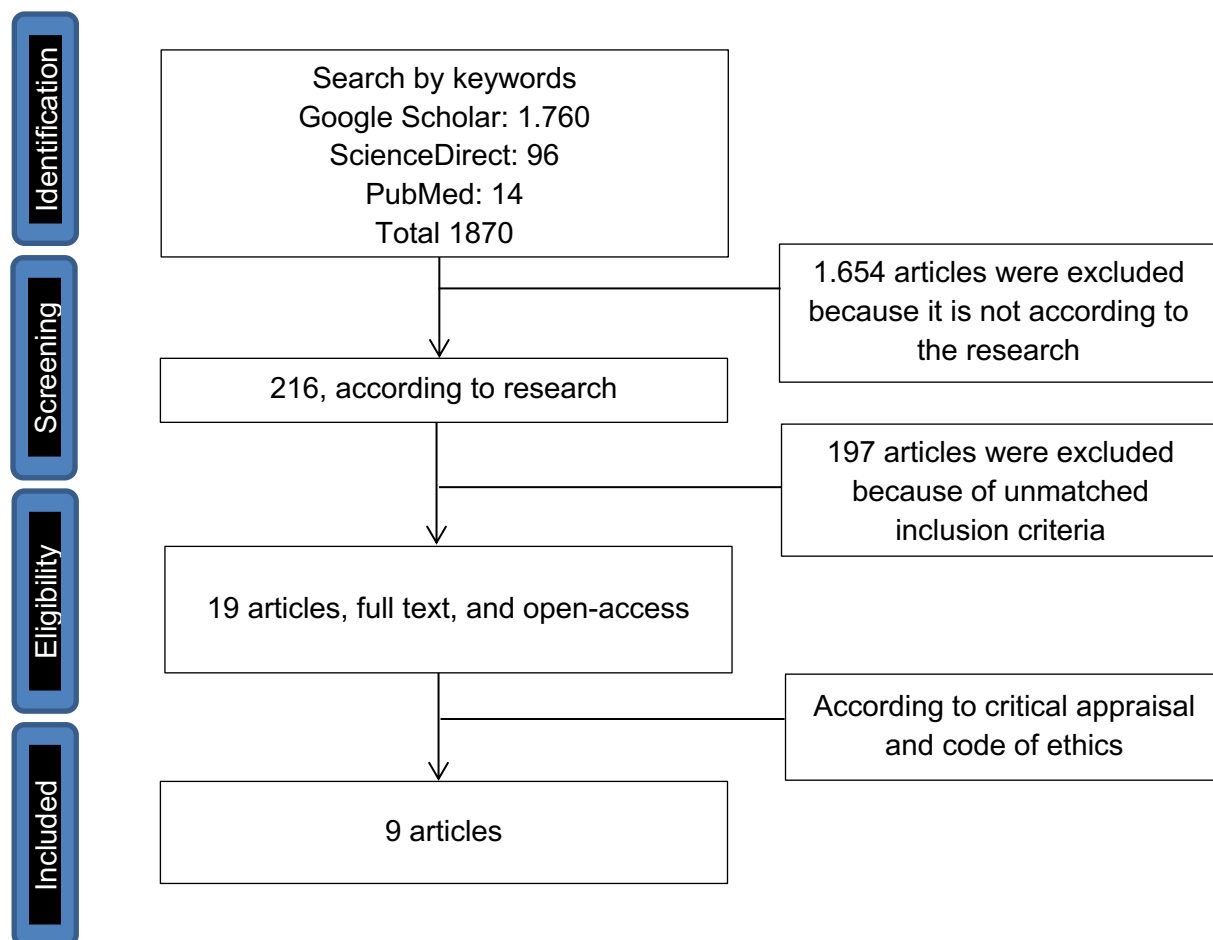


Figure 1. PRISMA method flow

The PRISMA method flow is used to evaluate systematic reviews or meta-analyses. PRISMA assists authors and researchers in creating high-quality systematic reviews and meta-analyses.¹⁵ The identification stage was found in 1760 articles using the keywords food consumption, pregnant women, and chronic energy deficiency in the Google Scholar, PubMed, and ScienceDirect databases. Then, 1654 articles were excluded because they did not meet the inclusion criteria, were about the health of pregnant women with chronic energy deficiency, were written in English or Indonesian, had full text, and were easily accessible. Unmatched inclusion of 197 articles was excluded. At the eligibility stage, 9 articles were obtained for analysis based on critical appraisal and code ethics.

Table 2 shows the outcomes of 9 article reviews conducted using the PRISMA method flow, which discussed consumption habits in pregnant women with chronic energy deficiency.

Table 2. Result of articles review

Title and Researcher	Design	Intervention	Result
Consumption of macronutrients in pregnant women with chronic energy deficiency during the Covid-19 pandemic. ¹²	With survey design using a saturated sample	Interview using 2 x 24-hour recall form, anthropometric measurement with body weight scale, and microtome	Level consumption of macronutrients in pregnant women with chronic energy deficiency in energy and carbohydrate intake 100%, protein intake 91.4%, and fat intake 57.1% are high deficit categories.
The factor of maternal and dietary habits with chronic energy deficiency in pregnant women in the UPTD of Kangkung Health Center. ¹⁶	Correlational descriptive with cross-sectional and using nonprobability sampling	Interview using the characteristic of respondent, maternal and dietary habits questionnaire	Significant between the age of pregnant women, parity, education, history of comorbidities, and bad dietary habits with chronic energy deficiency.
Health outcomes and socio-economic status among the mid-aged and elderly in China: Evidence from the CHARLS Nasional Baseline Data. ¹⁷	Research design using cross-sectional with purposive sampling technique	Interview using questionnaire	Dietary habits and low-income families can affect chronic energy deficiency.
The relationship of dietary habits between carbohydrate and protein with chronic energy deficiency pregnant women in the Pajangan Health Center, Bantul, Yogyakarta. ¹⁸	Research design using case-control with quota sampling technique	Interview using questionnaire	Dietary habits of intake of carbohydrate and protein low category are related to chronic energy deficiency in pregnant women.
Analysis of eating habits of pregnant women with chronic energy deficiency in the Palubala Health Center, Gorontalo Regency. ¹⁹	Research design using qualitative with snowball sampling technique	Interview and observation with pregnant women	Pregnant women do not apply eating habits with family, dietary habits are not variative, and they have inadequate food. Food taboos with intake energy and protein sources are fish, egg, and pineapple. Distribution of family meals and food selection not appropriate because of chronic energy deficiency
The relationship between food intake and chronic energy deficiency in pregnant women at the Simpang Tiga Health Center, Pekanbaru City, in 2019. ²⁰	Analytical descriptive design with cross-sectional and total sampling technique	Interview using recall questionnaire	Average pregnant women with chronic energy deficiency have less food intake.
Energy, Protein Intake and Mid-Upper Arm Circumference in Pregnant Women in Boyolali Regency, Indonesia. ²¹	Cross-sectional study and simple random sampling technique	Interview using Semi-Quantitative Food Frequency Questionnaire (SQ-FFQ) form.	Pregnant women experienced deficient energy and protein intake of 97.6% and 73.2%. A relationship exists between energy and protein intake with MUAC in pregnant women.

Household Food Security, Nutritional Intake and Nutritional Status of Pregnant Women in the Central Tapanuli Regency. ²²	Form of action research	The study used observation and interviews with a questionnaire to measure LiLA.	A significant relationship exists between food security status and energy and protein intake.
Nutrition Assistance Increases the Size of Middle-Upper Arm Circumference of Pregnant Women with Chronic Energy Deficiency. ²³	Pre-experimental study and using a purposive sampling technique	The study used both flyers and leaflets as media and the MUAC tape	There was an effect of nutrition support on the size of the mid-upper arm circumference of pregnant women at CED $p = 0.000$

DISCUSSION

The purpose of this systematic review study is to discuss the food consumption habits of pregnant women with chronic energy deficiency in order to improve nutrient intake during the COVID-19 pandemic. The government declared the COVID-19 Public Health Emergency in Presidential Decree Number 11 of 2020. Because of government regulations governing large-scale social restrictions, community access has been limited. The primary key to breaking the chain of transmission covid-19 is public awareness to keep their distance and implement health protocols. Public awareness and understanding of the coronavirus can provide greater insight into current perceptions and practice habits for COVID-19 prevention.^{24,25} To predict possible adverse outcomes during the COVID-19 pandemic, the impact of viremia during the first and second trimesters must be investigated.²⁶ Higher rates of asymptomatic COVID-19 infection may pose a challenge due to the lack of recommendations for routine COVID-19 detection or screening during the first and second trimesters of pregnancy.²⁷

Using the Google Scholar, PubMed, and ScienceDirect databases, nine articles were obtained based on the research findings. Pregnant women meet nutritional intake needs and aim to prevent undernutrition, according to one of our eight articles on eating habits. Due to insufficient family income, poor food ingredient selection, and a lack of family support to consume food nutrition, the average intake of energy, fat, and carbohydrates needs to be increased. The COVID-19 pandemic causes low macronutrient consumption, limiting access to food nutrition. The COVID-19 pandemic has had an impact on low-income families, reducing their purchasing power for food nutrition.¹²

One article discusses how to improve low nutritional status in pregnant women by measuring upper arm circumference chronic energy deficiency. Inadequate human resources lead to a lack of knowledge about pregnant women's nutritional needs. The level of education influences a person's attitude and behavior toward health. Pregnant women with a higher level of education are more likely to find pregnancy-related information. Providing education can help to increase pregnant women's knowledge about nutrition during pregnancy. Food education is provided to the community and families.²⁵ Knowledge is one factor associated with pregnant women's nutritional status because a good mother's knowledge influences the mother's daily dietary habits. So that the mother can manage her diet and avoid food rejection during pregnancy. As a result, the nutritional status during pregnancy can be adequately met.²⁸ In this case, knowledge is increased through the lecture method, which employs sheet media and leaflets.

CONCLUSION

Adequate eating habits for food intake and quality human resources can affect pregnant women's normal nutritional status.

Declarations

Authors' contribution

WTI: data collection, research design, manuscript writing, and analysis; VW and AL performed the analysis. All authors contributed to reviewing and evaluating this manuscript for publication.

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Conflict of interest

There is no conflict of interest in this research.

REFERENCES

1. World Health Organization. Maternal Mortality. Geneva; 2014.
2. Badan Pusat Statistik. Potret Awal Tujuan Pembangunan Berkelanjutan (Sustainable Development Goals) di Indonesia. 2016;
3. Badan Penelitian dan Pengembangan Kesehatan. Laporan Nasional Riskesdas 2018. Badan Penelitian dan Pengembangan Kesehatan. 2019.
4. Kementerian Kesehatan Republik Indonesia. Pelayanan Kesehatan Masa Sebelum Hamil, Masa Hamil, Persalinan, dan Masa Sesudah Melahirkan, Penyelenggaraan Pelayanan Kontrasepsi serta Pelayanan Kesehatan Seksual. Jakarta; 2014.
5. Edowai N, Rantetampang A, Msen Y, Mallongi A, Author C. Factors Influencing with Malnutrition Pregnant at Tigi District Deiyai Regency. *International Journal of Science and Healthcare Research* (www.ijshr.com). 2018;3(4):245.
6. Asnidar. *Jurnal life birth*. Life Birth. 2017;1(April):20–7.
7. Rachmawati NC, Dewi YLR, Widyaningsih V. Multilevel Analysis on Factors Associated with Occurrence Chronic Energy Deficiency among Pregnant Women. *Journal of Maternal and Child Health*. 2019;4(6):474–85.
8. Diddana TZ. Factors associated with dietary practice and nutritional status of pregnant women in Dessie town, northeastern Ethiopia: A community-based cross-sectional study. *BMC Pregnancy Childbirth*. 2019;19(1):1–10.
9. Hamzah DF. Analisis Faktor yang Mempengaruhi Kejadian Kekurangan Energi Kronis (KEK) Pada Ibu Hamil Di Wilayah Kerja Puskesmas Langsa Kota Langsa Provinsi Aceh Tahun 2016. *Jurnal Ilmiah Penelitian Kesehatan*. 2017;2(2):1–11.
10. Survei Diet Total. Diet Total Study: Survey of Individual Food Consumption Indonesia 2014. Ministry of Health Republic of Indonesia. 2014;
11. Kementerian Kesehatan Republik Indonesia. Angka Kecukupan Gizi 2019. Vol. Nomor 65, Menteri Kesehatan Republik Indonesia Peraturan Menteri Kesehatan Republik Indonesia. Jakarta; 2019.
12. Abadi E, Putri LAR. Konsumsi Makronutrien pada Ibu Hamil Kekurangan Energi Kronik (KEK) di Masa Pandemi Covid-19. *Jurnal Kesehatan Manarang*. 2020;6(2):85.

13. Pollock A, Berge E. How to do a systematic review. *International Journal of Stroke*. 2018;13(2):138–56.
14. Frandsen TF, Bruun Nielsen MF, Lindhardt CL, Eriksen MB. Using the full PICO model as a search tool for systematic reviews resulted in lower recall for some PICO elements. *J Clin Epidemiol*. 2020;127:69–75.
15. Page MJ, McKenzie JE, Bossuyt PM, Boutron I, Hoffmann TC, Mulrow CD, et al. The PRISMA 2020 statement: An updated guideline for reporting systematic reviews. *The BMJ*. 2021;372.
16. Hikmah H. Faktor Maternal dan Pola Makan Dengan Kejadian. *Kebinaan Malakbi*. 2020;1:22.
17. Williams, B., Jalilianhasanpour, R., Matin, N., Fricchione, G. L., Sepulcre, J., Keshavan, M. S., ... & Perz, D. L. (2018). Individual differences in corticolimbic structural profiles linked to insecure attachment and coping styles in motor functional ne 230-237. *Health Outcomes and Socio-economic Status among the Mid-Aged and Elderly in China: Evidence from the CHARLS Nasional Baseline Data*. *Physiol Behav*. 2019;176(3):139–48.
18. Anggoro SA. Hubungan Pola Makan (Karbohidrat dan Protein) Dengan Kejadian Kekurangan Energi Kronik pada Ibu Hamil di Puskesmas Pajangan Bantul Yogyakarta. *Nutriology : Jurnal Pangan, Gizi, Kesehatan*. 2020;1(2):42–8.
19. Muhamad Z, Hamalding H, Ahmad H. Analisis Kebiasaan Makan Pada Ibu Hamil Kekurangan Energi Kronik Di Wilayah Kerja Puskesmas Pulubala Kabupaten Gorontalo. *Jurnal Komunitas Kesehatan Masyarakat*. 2019;1(1):48–58.
20. Harahap JR, Susilawati E, Daniati NPR. Hubungan Asupan Makanan Terhadap Kejadian Kekurangan Energi Kronis (Kek) Pada Ibu Hamil Di Puskesmas Simpang Tiga Kota Pekanbaru Tahun 2019. *Jurnal Ibu dan Anak*. 2019;7(1):17–23.
21. Mutalazimah M, Wijaya YA, Suswardany DL. Energy, protein intake and mid-upper arm circumference in pregnant women in boyolali regency, Indonesia. *Malaysian Journal of Medicine and Health Sciences*. 2020;16(9):77–83.
22. Sudaryati E, Zuska F, Masthalina H. Household food security, nutritional intake, and nutritional status of pregnant women in the central tapanuli regency. *Open Access Maced J Med Sci*. 2021;9:1560–4.
23. Abadi E, Putri LAR. Nutrition Assistance Increases the Size of Middle-Upper Arm Circumference of Pregnant Women With Chronic Energy Deficiency. *Public Health of Indonesia*. 2020;6(4):157–62.
24. Presiden Republik Indonesia. Peraturan Presiden Republik Indonesia Nomor 82 tahun 2020 tentang Komite Penanganan Corona Virus Disease 2019 (COVID-19) dan Pemulihan Ekonomi Nasional. 2020;22 hal.
25. Martorell R, Zongrone A. Intergenerational influences on child growth and undernutrition. *Paediatr Perinat Epidemiol*. 2012;26(SUPPL. 1):302–14.
26. Chen Y, Li Z, Zhang YY, Zhao WH, Yu ZY. Maternal health care management during the outbreak of coronavirus disease 2019. *J Med Virol*. 2020;92(7):731–9.
27. Dashraath P, Wong JLJ, Lim MXK, Lim LM, Li S, Biswas A, et al. Coronavirus disease 2019 (COVID-19) pandemic and pregnancy. *Am J Obstet Gynecol*. 2020;222(6):521–31.
28. Rahman MS, Howlader T, Masud MS, Rahman ML. Association of low-birth weight with malnutrition in children under five years in Bangladesh: Do mother's education, socio-economic status, and birth interval matter? *PLoS One*. 2016;11(6):1–16.