

Systematic Review: Covid-19 Pandemic Risk in Nutritional View on Pregnant Mothers and Infants

Fahmil Usman¹, Harsono Salimo² and Adi Magna Patriadi Nuhriawangsa²

¹*Clinical Nutrition, Graduate School, Universitas Sebelas Maret, Surakarta, Indonesia*

²*Graduate School, Universitas Sebelas Maret, Surakarta, Indonesia*

Keywords: Covid-19 Pandemic, Dietary Habit, Food, Nutrition.

Abstract: Covid-19 has made an impact on individual dietary habits and bad nutritional state, especially to the weakly susceptible group of people such as children, pregnant and breastfeeding mothers, and has been the major social health issue. The objective of this article is to discern the risk of Covid-19 pandemic and its impact on the dietary habit, diet, and nutrition of pregnant mothers and infants. The method used is systematic review from several references with such keywords in Google Scholar database and Pubmed Research Gate. Covid-19 pandemic in Mexico caused the significant decrease of food security from 38.9% in 2018 to 24.9% in June 2020 in domestic dietary habits and food insecurity. The positive change of dietary habits includes the consumption decrease of fried food, snacks, fast food, red meat, pastries, or sweet beverages, and the increase of olive oil, vegetables, fruits, and nuts consumption. The negative change of dietary habits puts the mothers and children nutritional health at risk, which is vulnerable due to mobility limitation, economic crisis, food insecurity, and large-scale unemployment. It causes insufficient nutritional supply to such a weakly susceptible group of people, incurring 28.000 and 168.000 death cases of mothers and newborn infants respectively.

1 INTRODUCTION

Based on the report received by the World Health Organization (WHO) in December 2019, cases of pneumonia caused by severe acute respiratory syndrome coronavirus 2 were grouped into four (SARS-CoV-2) (WHO, 2020). In Indonesia, coronavirus 2 (SARS-CoV-2) spread widely with increasing positive cases with a total of 1.68 million cases (Covid19, 2021). Positive cases of COVID-19 increases drastically so that it was designated as a pandemic. Therefore, the government has issued policies including social restriction, travel restriction, even lockdown. They are predicted to trigger poor economic conditions, decreased production and consumption activities, job losses, increased unemployment, and hampered economic growth (Schneeweiss et al., 2020).

The COVID-19 pandemic has led to an increase in food insecurity in the community which triggers serious public health problems (Pedroso et al., 2020). It causes changes in individual dietary habits and poor nutritional status due to the stay-at-home policy. Indeed, it affects lifestyle, including dietary habits,

irregular eating patterns, and physical activity patterns covering physical and mental health (Naja & Hamadeh, 2020). This pandemic is projected to have a severe impact on food security, nutrition, and health, particularly for vulnerable groups such as young children, pregnant and breastfeeding mothers, resulting in 28,000 maternal deaths and 168,000 stillbirth cases (Robertson et al., 2020).

The COVID-19 pandemic has changed the socioeconomic order including the education, health, food, and income sectors (Nicola et al., 2020). Low income affects the ability of the household to afford foods (Pechey & Monsivais, 2016). Less optimal food intake has an impact on the nutritional status of pregnant women, including the infant (Department of Health and Ageing & National Health and Medical Research Council, 2017). Pregnant women with abnormal nutritional causes a higher risk of preterm birth than those with normal nutritional status (Grieger & Clifton, 2015). Poor quality and quantity of food intake during pregnancy cause a high risk of micronutrient deficiencies, such as Fe, vitamin B9, iodine, zinc, vitamins A and D, riboflavin, B6 and

B12, that have adverse effects on both the mother and infant (Haider et al., 2011; Torheim et al., 2010).

Health problems in pregnant women such as anemia and chronic energy deficiency (CED) are caused by a lack of food intake for a long period due to lack of access to food which mostly occurs in low-income households (Pechey & Monsivais, 2016). The health of pregnant women and maternal, newborns, and children health services become the main concerns of health problems, particularly in low- and middle-income countries during COVID-19 (Robertson et al., 2020). A systematic review and meta-analysis concluded that the risk of preterm birth increases by 29% in thin women and increases by 64% of Low Birth Weight (LBW). This condition decreases the children's intelligence (cognitive), increases the risk of degenerative diseases when become adults (Han et al., 2011), growth delay, and infectious diseases (Fitri, 2018).

The nutritional status disorder in pregnant women and infants may occur as a result of the COVID-19 pandemic which causes changes in diet, food access, and income. Therefore, this present study aims to identify the risks of the COVID-19 pandemic and nutritional problems in pregnant women and infants.

2 METHODS

This study used a systematic review method. This method aims to identify, review, evaluate, and interpret all available and interesting research topics. The researcher searched research articles both international and national using the Google Scholar and Pubmed Researchgate databases.

The researcher used several keywords to search the relevant research articles. The keywords were the impact of the COVID-19 pandemic on the economy, food, and nutrition; the impact of COVID-19 on foods; the impact of COVID-19 on diet, and the impact of COVID-19 on nutrition. Then, the researcher filtered the total articles that have been obtained through inclusion criteria. The inclusion criteria were published in 2020-2021 and nationally and internationally accredited. The data were analyzed by explaining each research article that discusses the impact of the COVID-19 pandemic on the economy, food, and nutrition.

In the identification process, the obtained articles were re-checked. This process found 165 titles (Google scholar 60 articles and Pubmed Researchgate 105 articles) based on keywords. The next step was screening based on the inclusion criteria and the appropriate theme, getting 30 articles for the literature

review, and explaining 5 articles according to the theme.

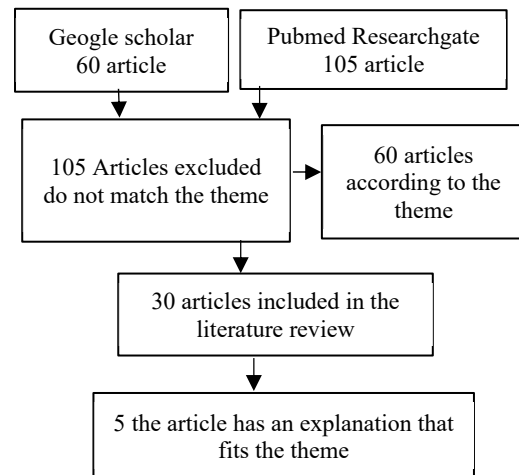


Figure 1. Article Selection Flowchart.

3 RESULTS AND DISCUSSION

3.1 COVID-19 Relation to Nutrition

Based on a survey conducted in America during the COVID-19 pandemic, many low-income Americans were most likely to get sick and die from COVID-19. It is followed by job loss or drastically reduced income which tend to increase poverty rates. Therefore, it causes difficulty in purchasing foods and food insecurity (Parolin & Wimer, 2020). Food insecurity is a condition of limited access or insufficient nutritious foods to meet the daily needs. People who experience food insecurity can lead to hunger in which it is maybe due to lack of financial resources or low income which make them unable to buy purchase foods or no access to food which causes stress, a physical and mental health problem which is dangerous in the short and long term (Fang & Cao, 2014). COVID-19 has destabilized access and availability of food around the world resulting in massive unemployment and loss of income, as well as food insecurity (Bauer, 2020).

Food insecurity, disturbing food production, and consumption facilities, food availability, and food prices amid the COVID-19 pandemic were due to significant changes in the food sector during the COVID-19 pandemic, particularly to adjust the protocol during production to support the quality and quantity of food safety. It occurred as a result of the implementation of social/physical distancing or large-scale social restriction policies (PSBB) in

several areas. Therefore, it is important to adjust to policy strategies related to food to ensure food security and safety in Indonesia. The COVID-19 pandemic has disrupted food production in terms of agricultural machinery and equipment, subsidies for fertilizers and seeds, and other production support facilities. Thus, increasing production is a priority and needs to be monitored by the Ministry of Agriculture and the Agriculture Service to ensure the proper distribution of facilities and assistance as well as the socialization of the safe production protocols. Therefore, the government has to pay attention to good food distribution and the national food logistics system (Hirawan & Verselita, 2020; Khairunnisa, 2020).

A study reveals that if the COVID-19 pandemic continues, food insecurity will continue to occur in low-income households in which vulnerable groups such as small children, adolescents, pregnant women, and breastfeeding mothers need to be highly protected. In the future, health will depend on food, nutrition, and social protection systems and to ensure that every community can access food and have food security, sufficient economy, and good nutrition status to protect them from malnutrition and other nutritional problems due to related food, nutrition, health, and socioeconomic problems (Pérez-Escamilla et al., 2020). It means that households with low income have unstable quality and quantity of foods, disrupted food security and nutrition. Further, if they are experienced by pregnant women, they can cause nutritional problems which directly affect the nutrition status of the infant (Myrnawati & Anita, 2016).

Poor families are vulnerable to malnutrition because of their low ability to access good food (Sebataraja et al., 2014). In some countries, experiencing a decline or economic crisis becomes one of the causes of the low birth weight of <2500 grams (LBW) (Martinson & Reichman, 2016). An epidemiological case-control study revealed that the income of pregnant women and food insecurity are the causes of low birth weight (LBW) (Altenhöner et al., 2016).

3.2 The Risk of COVID-19 Pandemic

3.2.1 COVID-19 and Food Insecurity

A previous study by Chiwona-Karltun et al., (2021) has assessed the impact of the spread of COVID-19 on economic and food insecurity. Based on the collected qualitative data from 12 countries in South Sahara revealed that the lockdown policy during the

COVID-19 pandemic created anxiety of household food security, health, economic and human rights, or welfare problems. The lockdown has affected food security as the stay-at-home policy threatens food production which relies on agriculture as the main economic activity.

Food insecurity occurs particularly in poor households and rural or remote communities (Malapit et al., 2020). The main contributing factors to food security are poverty, conflict, climate changes, ecosystem challenges, and economic decline. A country can maintain its food security through the availability of natural resources, and appropriate policies on natural resources as well as the implementation of the policy (Carletto et al., 2013).

An online survey has measured the risk of COVID-19 on low-income adults in the United States in the middle of March 2020 in which it can be accessed through Smartphone or computer/laptop. The survey was adjusted to the age, gender, ethnicity of the total population. A total of 1,497 participants completed the survey. It concludes that the COVID-19 pandemic affects the household's income and food access as well as causing social and economic chaos (Wolfson & Leung, 2020). Another study Ahn & Norwood (2021) has measured food insecurity during the COVID-19 pandemic and it concludes that food insecurity increases three points in each household compared to the previous year. A study conducted in Mexico revealed that the household's food security decreases from 38.9% in 2018 to 24.9% in June 2020 (Gaitán-Rossi et al., 2021). Therefore, it is important to rethink the dysfunctional food security system in which now the world depends and reconfigure the type of cross-sectoral program, policy, and mechanism needed to ensure food security and nutrition for all, including youth, children, pregnant women, and breastfeeding mothers (UNICEF, 2020).

Studies during the pandemic are suggested to focus on nutrition and foods including (1) adapt and continue the provision of supplementary foods at school and food assistance program for households with children, youth, pregnant women, and breastfeeding mothers during quarantine; (2) develop an equal fast-response and effective system to prevent or reduce food insecurity based on the complex adaptive framework (Barnhill et al., 2018) which discusses food system, nutrition, health care, and social protection as well as the complex correlation between each of them; provide special attention to households with children, youth, pregnant women, and breastfeeding mothers; and (3) monitor and use effective surveillance system to identify and target the provision of healthy and nutritious foods for

vulnerable families such as families with children, youth, pregnant women, and breastfeeding mothers. Based on the evidence from the UNICEF 2020 report which summarizes the impact of the COVID-19 pandemic on health, such as the number of children under 5 years old visiting community health centers in Vietnam dropping by 48%, in Indonesia more than 50% of households are reported to be unable to meet the nutritional needs of their families. Philippines more than 80% experienced a decline in household income, the study aims to protect the food security and nutrition, as well as health and welfare of families with children, youth, pregnant women, and breastfeeding mothers (WHO, 2000).

3.2.2 Changes in Diet

Lifestyles tend to drastically change during a pandemic as a result of government policies that require people to stay at home. A previous study concerning the changes in diet during the COVID-19 pandemic found that the COVID-19 pandemic highly affects the economy, food industry, and diet (Rahmah, 2017). Changes in diet before and during the COVID-19 pandemic can be seen clearly (Eftimov et al., 2020).

The study is in line with a previous study by Ammar et al in which lifestyle changed dramatically during the COVID-19 pandemic (Ammar et al., 2020). It is an online study conducted in April 2020 involving 1,047 participants to investigate the effects of social restrictions on physical activity and dietary behavior across continents from Europe, North Africa, West Asia, and North America. It was reported that the restrictions have an adverse effect on physical activities in which respondents decreased their physical activity during the pandemic. Besides, the stay-at-home policy is associated with unhealthy dietary patterns as participants reported an increased frequency of eating unhealthy foods, eating out of control, snacking between meals, and increased number of meals per day (Ammar et al., 2020). The behavior change is likely due to the anxiety and boredom of staying at home in which people tend to eat more, change lifestyle patterns, and reduce diet quality (Naja & Hamadeh, 2020).

On the other hand, studies concerning dietary behaviors in the Spanish adult population revealed healthier dietary behaviors (for example, reduced intake of fried foods, snacks, fast food, red meat, pastries, or sugary drinks, but an increase in olive oil, vegetables, fruits or nuts) during the quarantine due to COVID-19 pandemic compared to previous

behaviors (Rodríguez-Pérez et al., 2020). It is in line with a study by Eftimov et al., (2020).

The quarantine results in positive and negative changes in diet and lifestyle. It is crucial to identify groups that are at higher risk for unhealthy lifestyles during the COVID-19 pandemic and to create targeted recommendations to maintain health and to prevent chronic disease (Górnicka et al., 2020) as well as maintain weight or nutritional status. Changes in diet also affect nutritional status during the pandemic (Górnicka et al., 2020) as an indicator of causing long-term effects of other chronic health (Yousafzai et al., 2013).

Changes in diet, especially in pregnant women, have the potential to have a low birth weight baby, pre-term birth, and stillbirth which will further increase nutritional problems such as stunting and malnutrition (Bianchi et al., 2016; Danielewicz et al., 2017)(Bianchi et al., 2016; Danielewicz et al., 2017). Therefore, the government and health workers should play an important role in formulating policies in providing dietary counseling, monitoring the development of pregnant women who may be at risk due to unbalanced diet and lifestyles (Iordachescu et al., 2020).

3.2.3 The Impact of the COVID-19 Pandemic and Nutritional Problems in Pregnant Women and Infant

The health of pregnant women, infant, and children especially in low-middle-income countries become the main concern during COVID-19. It is maybe partly due to worry about insufficient health services, limited availability of transportation, and health facilities. Maternal and Child Health Services (MCH) has become the key factor of drastic decline in maternal and infant mortality, as well as malnutrition in recent decades (Robertson et al., 2020).

During the pandemic, pregnant women tend to have unstable emotions, changes in diet with increased food intake and decreased physical activity. Thus, they tend to eat a lot of snacks which can cause obesity, especially those living in severely affected areas. Obesity increase risk of chronic conditions such as cardiovascular disease (Zhang et al., 2020).

During the pandemic, changes in nutritional status can happen to anyone, including pregnant women who are affected, in which they experienced changes in diet, economic decline, and household food insecurity (Huizar et al., 2021; Mehta, 2020). The health of pregnant women is determined by the nutritional status and the fulfillment of nutritional intake. Pregnant women need sufficient nutritional

intake to maintain normal nutritional status. If their nutritional intake is not balanced, it can cause nutritional deficiencies and will result in poor nutritional status (Khasanah, 2020). Lack of nutritional intake during pregnancy can affect the growth of the fetus (Kartikasari et al., 2013). Malnutrition during pregnancy can cause risks and complications for the mother, such as anemia, bleeding, abnormal maternal weight, infectious diseases, and low birth weight (Rukmana & Kartasurya, 2014).

A study Panthi et al. (2020) focusing on women and children in Nepal during the COVID-19 pandemic revealed that malnutrition in women and children is a prolonged hunger causing malnutrition due to food insecurity, job loss, economic crisis, and limited access to health services (Ministry of Health et al., 2017). It is associated with a high rate of stunting, an increase in infants with low birth weight (LBW) due to insufficient nutritional intake during pregnancy. LBW will increase the morbidity and mortality of children resulting in future generations with lower physical and cognitive potential. The COVID-19 pandemic and stay-at-home policy can be a risk factor for malnutrition (Panthi et al., 2020).

Another study Abadi & Putri (2020) on macronutrient consumption in pregnant women with chronic energy deficiency found lack of food intake such as energy, protein, fat, and carbohydrates during the COVID-19 pandemic. Anggraini et al (2021) stated that pregnant women need optimal food intake to maintain their health and the fetus during the pandemic. They need more intake of supplements, iron, Vitamin C, and macronutrient containing carbohydrates, protein and fat, to meet their nutritional needs. Further, they are suggested eating breakfast, eating high-fiber foods, increasing fluid intake, and applying a healthy diet regularly (Anggraini & Anjani, 2021).

This pandemic has the potential to increase the prevalence of maternal and newborn mortality (Robertson et al., 2020). Malnutrition in pregnant women, especially with anemia and underweight, can increase the number of stunting if it is not managed properly and even can cause overweight and obesity in all age groups due to limited physical activity and increased consumption of processed foods containing high levels of sugar, salt, and fat (UNICEF, 2020).

4 CONCLUSIONS

The COVID-19 pandemic has impact of an economic crisis, changes in diet, and mass unemployment and a

decline in household food security. In Mexico during the COVID-19 pandemic, food security decreased from 38.9% in 2018 to 24.9% in June 2020 in households. Food insecurity is an indirect risk to health, including the nutritional status of mothers and children which will have an impact on increasing the prevalence of nutritional problems such as stunting, LBW, Chronic Energy Deficiency, and obesity. This pandemic is projected to have an impact on vulnerable groups including young children, pregnant and lactating mothers, resulting in 28,000 maternal deaths and 168,000 newborns.

On the other hand, in some other people, changes in the diet tend to improve due to afraid of the pandemic so that they prefer consuming healthy foods such as olive oil, vegetables, fruit, or nuts.

REFERENCES

- Abadi, E., & Putri, L. A. R. (2020). Konsumsi Makronutrien pada Ibu Hamil Kekurangan Energi Kronik (KEK) di Masa Pandemi Covid-19. *Jurnal Kesehatan Manarang*, 6(2), 85–90. <https://doi.org/10.33490/jkm.v6i2.337>
- Ahn, S., & Norwood, F. B. (2021). Measuring food insecurity during the COVID-19 pandemic of spring 2020. *Applied Economic Perspectives and Policy*, 43(1), 162–168.
- Altenhöner, T., Köhler, M., & Philippi, M. (2016). The Relevance of Maternal Socioeconomic Characteristics for Low Birth Weight—a Case-Control Study. *Geburtshilfe Und Frauenheilkunde*, 76(03), 248–254.
- Ammar, A., Brach, M., Trabelsi, K., Chtourou, H., Boukhris, O., Masmoudi, L., Bouaziz, B., Bentlegui, E., How, D., Ahmed, M., Müller, P., Müller, N., Aloui, A., Hammouda, O., Paineiras-Domingos, L. L., Braakman-Jansen, A., Wrede, C., Bastoni, S., Pernambuco, C. S., ... Hoekelmann, A. (2020). Effects of COVID-19 Home Confinement on Eating Behaviour and Physical Activity: Results of the ECLB-COVID19 International Online Survey. *Nutrients*, 12(6), E1583. <https://doi.org/10.3390/nu12061583>
- Anggraini, N. N., & Anjani, R. D. (2021). Kebutuhan Gizi Ibu Hamil Pada Masa Pandemi Covid-19. *Jurnal Pangan dan Gizi*, 11(1), 42–49. <https://doi.org/10.26714/jpg.11.1.2021.42-49>
- Bauer, L. (2020, May 6). *The COVID-19 Crisis Has Already Left Too Many Children Hungry in America | The Hamilton Project*. https://www.hamiltonproject.org/blog/the_covid_19_crisis_has_already_left_too_many_children_hungry_in_america
- Bianchi, C. M., Mariotti, F., Verger, E. O., & Huneau, J.-F. (2016). Pregnancy Requires Major Changes in the Quality of the Diet for Nutritional Adequacy: Simulations in the French and the United States

- Populations. *PLOS ONE*, *11*(3), e0149858. <https://doi.org/10.1371/journal.pone.0149858>
- Carletto, C., Zezza, A., & Banerjee, R. (2013). Towards better measurement of household food security: Harmonizing indicators and the role of household surveys. *Global Food Security*, *2*(1), 30–40.
- Chiwona-Karltun, L., Amuakwa-Mensah, F., Wamala-Larsson, C., Amuakwa-Mensah, S., Hatab, A. A., Made, N., Taremwa, N. K., Melyoki, L., Rutashobya, L. K., & Madonsela, T. (2021). COVID-19: From health crises to food security anxiety and policy implications. *Ambio*, *50*(4), 794–811.
- Covid19, S. T. P. (2021). *Peta Sebaran COVID-19*. Covid19.Go.Id. <https://covid19.go.id/peta-sebaran-covid19>
- Danielewicz, H., Myszczyzyn, G., Dębińska, A., Myszkal, A., Boznański, A., & Hirnle, L. (2017). Diet in pregnancy—More than food. *European Journal of Pediatrics*, *176*(12), 1573–1579. <https://doi.org/10.1007/s00431-017-3026-5>
- Department of Health and Ageing, & National Health and Medical Research Council. (2017). *Nutrient Reference Values for Australia and New Zealand Including Recommended Dietary Intakes* (2nd ed.).
- Eftimov, T., Popovski, G., Petković, M., Seljak, B. K., & Kocev, D. (2020). COVID-19 pandemic changes the food consumption patterns. *Trends in Food Science & Technology*, *104*, 268–272. <https://doi.org/10.1016/j.tifs.2020.08.017>
- Fang, Z., & Cao, C. (2014). Estimation of Forest Canopy Height Over Mountainous Areas Using Satellite Lidar. *IEEE Journal of Selected Topics in Applied Earth Observations and Remote Sensing*, *7*(7), 3157–3166. <https://doi.org/10.1109/JSTARS.2014.2300145>
- Fitri, L. (2018). Hubungan BBLR Dan Asi Eksklusif Dengan Kejadian Stunting Di Puskesmas Lima Puluh Pekanbaru. *Jurnal Endurance: Kajian Ilmiah Problema Kesehatan*, *3*(1), 131–137.
- Gaitán-Rossi, P., Vilar-Compte, M., Teruel, G., & Pérez-Escamilla, R. (2021). Food insecurity measurement and prevalence estimates during the COVID-19 pandemic in a repeated cross-sectional survey in Mexico. *Public Health Nutrition*, *24*(3), 412–421. <https://doi.org/10.1017/S1368980020004000>
- Górnicka, M., Drywień, M. E., Zielinska, M. A., & Hamułka, J. (2020). Dietary and Lifestyle Changes During COVID-19 and the Subsequent Lockdowns among Polish Adults: A Cross-Sectional Online Survey PLifeCOVID-19 Study. *Nutrients*, *12*(8), 2324. <https://doi.org/10.3390/nu12082324>
- Grieger, J. A., & Clifton, V. L. (2015). A review of the impact of dietary intakes in human pregnancy on infant birthweight. *Nutrients*, *7*(1), 153–178.
- Haider, B. A., Yakoob, M. Y., & Bhutta, Z. A. (2011). Effect of multiple micronutrient supplementation during pregnancy on maternal and birth outcomes. *BMC Public Health*, *11*(3), 1–9.
- Han, Z., Mulla, S., Beyene, J., Liao, G., & McDonald, S. D. (2011). Maternal underweight and the risk of preterm birth and low birth weight: A systematic review and meta-analyses. *International Journal of Epidemiology*, *40*(1), 65–101.
- Hirawan, F. B., & Verselita, A. A. (2020). *Kebijakan pangan di masa pandemi Covid-19*. CSIS Indonesia.
- Huizar, M. I., Arena, R., & Laddu, D. R. (2021). The global food syndemic: The impact of food insecurity, Malnutrition and obesity on the healthspan amid the COVID-19 pandemic. *Progress in Cardiovascular Diseases*, *64*, 105–107. <https://doi.org/10.1016/j.pcad.2020.07.002>
- Iordachescu, A. C., Cirstoiu, M. M., Zugravu, C.-A., Teodor, O. M., Turcan, N., Ducu, I., & Bohiltea, R. E. (2020). Dietary behavior during pregnancy. *Experimental and Therapeutic Medicine*, *20*(3), 2460–2464. <https://doi.org/10.3892/etm.2020.8804>
- Kartikasari, B. W., Mifbakhuddin, M., & Mustika, D. N. (2013). Hubungan pendidikan, paritas, dan pekerjaan ibu dengan status gizi ibu hamil trimester III di Puskesmas Bangetayu Kecamatan Genuk Kota Semarang tahun 2011. *Jurnal Kebidanan*, *1*(1), 9–18.
- Khairunnisa, S. N. (2020, Oktober). *Ketahanan Pangan Dunia Terdampak Pandemi Covid-19* [News]. Kompas.Com. <https://www.kompas.com/food/read/2020/10/13/210700175/ketahanan-pangan-dunia-terdampak-pandemi-covid-19?page=all>
- Khasanah, Y. Y. (2020). Hubungan Pengetahuan Gizi Ibu Hamil Dengan Peningkatan Berat Badan Selama Kehamilan. *Syntax Literate ; Jurnal Ilmiah Indonesia*, *5*(6), 233. <https://doi.org/10.36418/syntax-literate.v5i6.1339>
- Malapit, H. J., Meinzen-Dick, R. S., Quisumbing, A. R., & Zselezcky, L. (2020). Women: Transforming food systems for empowerment and equity. *IFPRI Book Chapters*, 36–45.
- Martinson, M. L., & Reichman, N. E. (2016). Socioeconomic inequalities in low birth weight in the United States, the United Kingdom, Canada, and Australia. *American Journal of Public Health*, *106*(4), 748–754.
- Mehta, S. (2020). Nutritional status and COVID-19: An opportunity for lasting change? *Clinical Medicine*, *20*(3), 270–273. <https://doi.org/10.7861/clinmed.2020-0187>
- Ministry of Health, N., New ERA, & ICF. (2017). *Nepal Demographic and Health Survey 2016*. Ministry of Health, Nepal.
- Myrnawati, M., & Anita, A. (2016). Pengaruh Pengetahuan Gizi, Status Sosial Ekonomi, Gaya Hidup dan Pola Makan Terhadap Status Gizi Anak (Studi Kausal di Pos Paud Kota Semarang Tahun 2015). *Jurnal Pendidikan Usia Dini*, *10*(2), 213–232.
- Naja, F., & Hamadeh, R. (2020). Nutrition amid the COVID-19 pandemic: A multi-level framework for action. *European Journal of Clinical Nutrition*, *74*(8), 1117–1121.
- Nicola, M., Alsafi, Z., Sohrabi, C., Kerwan, A., Al-Jabir, A., Iosifidis, C., Agha, M., & Agha, R. (2020). The socio-economic implications of the coronavirus

- pandemic (COVID-19): A review. *International Journal of Surgery*, 78, 185–193.
- Panthi, B., Khanal, P., Dahal, M., Maharjan, S., & Nepal, S. (2020). An urgent call to address the nutritional status of women and children in Nepal during COVID-19 crises. *International Journal for Equity in Health*, 19(1), 87. <https://doi.org/10.1186/s12939-020-01210-7>
- Parolin, Z., & Wimer, C. (2020). Forecasting estimates of poverty during the COVID-19 crisis. *Poverty and Social Policy Brief*, 4(8).
- Pechey, R., & Monsivais, P. (2016). Socioeconomic inequalities in the healthiness of food choices: Exploring the contributions of food expenditures. *Preventive Medicine*, 88, 203–209.
- Pedroso, J., Buccini, G., Venancio, S. I., Pérez-Escamilla, R., & Gubert, M. B. (2020). Maternal mental health modifies the association of food insecurity and early child development. *Maternal & Child Nutrition*, 16(4), e12997.
- Pérez-Escamilla, R., Cunningham, K., & Moran, V. H. (2020). *COVID-19 and maternal and child food and nutrition insecurity: A complex syndemic*. Wiley Online Library.
- Rahmah, N. F. (2017). Hubungan Pengetahuan dan Perilaku Personal Kebersihan Genital Terhadap Kejadian Keputihan Pada Santriwati Smas/Ma di Ppm Rahmatul Asri Enrekang Tahun 2017. *Fakultas Kedokteran Universitas Hasanuddin: Makassar*.
- Roberton, T., Carter, E. D., Chou, V. B., Stegmuller, A. R., Jackson, B. D., Tam, Y., Sawadogo-Lewis, T., & Walker, N. (2020). Early estimates of the indirect effects of the COVID-19 pandemic on maternal and child mortality in low-income and middle-income countries: A modelling study. *The Lancet Global Health*, 8(7), e901–e908.
- Rodríguez-Pérez, C., Molina-Montes, E., Verardo, V., Artacho, R., García-Villanova, B., Guerra-Hernández, E. J., & Ruíz-López, M. D. (2020). Changes in Dietary Behaviours during the COVID-19 Outbreak Confinement in the Spanish COVIDiet Study. *Nutrients*, 12(6), 1730. <https://doi.org/10.3390/nu12061730>
- Rukmana, S. C., & Kartasurya, M. I. (2014). Hubungan Asupan Gizi dan Status Gizi Ibu Hamil Trimester III dengan Berat Badan Lahir Bayi di Wilayah Kerja Puskesmas Suruh Kabupaten Semarang. *Journal of Nutrition College*, 3(1), 192–199. <https://doi.org/10.14710/jnc.v3i1.4558>
- Schneeweiss, Z., Murtaugh, D., & Bloomberg Economics. (2020, May 28). This Is How Deeply the Coronavirus Changed Our Behavior. *Bloomberg.Com*. <https://www.bloomberg.com/news/features/2020-05-28/coronavirus-lockdown-crushed-economies-jobs-energy-and-shops>
- Sebataraja, L. R., Oenzil, F., & Asterina, A. (2014). Hubungan Status Gizi dengan Status Sosial Ekonomi Keluarga Murid Sekolah Dasar di Daerah Pusat dan Pinggiran Kota Padang Lisbet Rimelfhi Sebataraja. *Jurnal Kesehatan Andalas*, 3(2).
- Torheim, L. E., Ferguson, E. L., Penrose, K., & Arimond, M. (2010). Women in resource-poor settings are at risk of inadequate intakes of multiple micronutrients. *The Journal of Nutrition*, 140(11), 2051S-2058S.
- UNICEF. (2020). *COVID-19 dan Anak-Anak di Indonesia Agenda Tindakan untuk Mengatasi Tantangan Sosial Ekonomi*. UNICEF. https://www.unicef.org/indonesia/sites/unicef.org/indonesia/files/2020-05/COVID-19-dan-Anak-anak-di-Indonesia-2020_1.pdf
- WHO. (2000). *Obesity: Preventing and managing the global epidemic : report of a WHO consultation*. World Health Organization. <https://apps.who.int/iris/handle/10665/42330>
- WHO, W. H. O. (2020, March 8). *Media Statement: Knowing the risks for COVID-19*. <https://www.who.int/indonesia/news/detail/08-03-2020-knowing-the-risk-for-covid-19>
- Wolfson, J. A., & Leung, C. W. (2020). Food insecurity and COVID-19: Disparities in early effects for US adults. *Nutrients*, 12(6), 1648.
- Yousafzai, A. K., Rasheed, M. A., & Bhutta, Z. A. (2013). Annual Research Review: Improved nutrition--pathway to resilience. *Journal of Child Psychology and Psychiatry, and Allied Disciplines*, 54(4), 367–377. <https://doi.org/10.1111/jcpp.12019>
- Zhang, J., Zhang, Y., Huo, S., Ma, Y., Ke, Y., Wang, P., & Zhao, A. (2020). Emotional Eating in Pregnant Women during the COVID-19 Pandemic and Its Association with Dietary Intake and Gestational Weight Gain. *Nutrients*, 12(8), E2250. <https://doi.org/10.3390/nu12082250>