
RESEARCH ARTICLE

Covid-19 Prevention Model in People with Diabetes Mellitus Based on Health Promotion Model

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ABSTRACT

Diabetes mellitus is identified as one of the factors of COVID-19. People with diabetes, when infected with COVID-19, will experience worse clinical symptoms. This study aims to develop a model for preventing COVID-19 in people with diabetes mellitus using the Health Promotion Model theory from Nola J Pender. This study used a cross-sectional approach. The population in this study was diabetes mellitus patients at Al Mustofa Lamongan Clinic. The sample size was 110 respondents. The sampling technique used is simple random sampling. The variables in this study are biological factors, previous behavioral factors, psychological factors, sociocultural factors, cognition and affection, family support factors, and prevention of COVID-19 in people with diabetes mellitus. Data analysis used Partial Least Square (PLS). Psychological actors (motivation, personality, anxiety) influenced factors of cognition and affection. Psychological actors influence family support factors. Sociocultural factors (education, norms, and social networks) influence family support. Cognition and affection factors (barriers, benefits, and self-efficacy) influence COVID-19 prevention behaviors. Family support factors (emotional, instrumental, reward, and informational support) influence COVID-19 prevention behavior in people with diabetes mellitus with a statistical T value of > 1.96. Improving the prevention of COVID-19 for people with diabetes mellitus is carried out by increasing one's understanding of the benefits and barriers of preventing COVID-19 and increasing self-efficiency. Family involvement in COVID-19 prevention and its active role in improving COVID-19 prevention. Active family involvement in COVID-19 prevention can increase confidence to behave according to the expectations of important people such as family. Family plays an essential role in prevention efforts.

KEYWORDS

Diabetes Mellitus, Prevention, Covid-19, Health Promotion Mode

ARTICLE INFORMATION

ACCEPTED: 11 May 2023

PUBLISHED: 20 May 2023

DOI: 10.32996/bjns.2023.3.1.8

1. Introduction

Diabetes Mellitus is a chronic inflammatory disease caused by an imbalance of the immune system, SME metabolic syndrome, and is a health threat to the community and is the leading cause of death in adulthood worldwide (WHO, 2021). Diabetes mellitus is said to be one of the aggravating factors causing the spread of the COVID-19 virus throughout the world. (Zhou et al., 2020). Most diabetics when infected with COVID-19 experience worse clinical symptoms (Shi et al., 2021). Patients with COVID-19 with comorbid diabetes have a double and more severe risk of death. Diabetic comorbidities affect the exacerbation of infection cases and increase the risk of death. (Taye et al., 2020).

COVID-19 prevention behavior in diabetics needs to be improved; its application not only controls blood sugar levels but also must focus on preventing COVID-19. An approach by improving COVID-19 prevention behavior using the Health Promotion Model (HPM) theory and according to PERKENI recommendations is needed to improve the ability of DM sufferers to continue to routinely

check blood sugar levels, consume drugs, diet, manage stress and exercise while continuing to carry out health protocols according to government recommendations (Simanjuntak et al., 2020).

The number of new cases globally on July 25, 2021, was more than 3.8 million, an increase of 8% from the previous week; in August 2022, the number of people infected with COVID-19 in the world had reached 608,871,707 cases. The total death toll reportedly increased by more than 6,498,881 deaths. The largest number of deaths were reported in the Americas and Southeast Asia (WHO, 2022). As of July 2021, there are more than 7 million COVID-19 cases in Indonesia, with the most cases in Aceh. On average, in 1 week, there are 162,382 cases (Ministry of Health of the Republic of Indonesia, 2020). The latest case report in August 2022 contained 6.3 million confirmed cases, and 157,591 deaths were recorded (Task Force, 2022). The total percentage of cases of patients who died or mortality with diabetes mellitus was known to be 11.6% (Ministry of Agriculture, 2018). The latest data on January 9, 2023, shows that there are 6.7 million cases of Covid-19 in Indonesia; in East Java, there are 637,043 cases, while in Lamongan, there are 9,531 cases (Task Force, 2022).

The mechanism that causes the increased risk of COVID-19 in diabetics is due to disruption of the body's immune system as the first line of defense against the virus (Pal & Bhadada, 2020). SARS-CoV-2 requires ACE2 receptors to attach and multiply. In DM, there will be an increase in ACE2. This can increase the severity 2-fold to death until the patient needs to be treated in the Intensive Care Unit (ICU) (Rejeki & Rahman, 2021). Disruption of immune system activation and inhibit immune stimulation supported by Th1 cells, so hyperinflammatory reactions occur (Gazzaz, 2021). An impaired immune system suffering from diabetes is associated with abnormal secretion of pro-inflammatory cytokines, high in TNF α and IFN in patients with COVID-19 (Jeong et al., 2020). This pro-inflammatory condition of diabetes will increase the severity of COVID-19 infection (Marhl et al., 2020).

The rapid spread of COVID-19 has caused health protocols to be insufficient. Lumber is effective in a short time to minimize transmission with the vaccine. (Octafia, 2021). The vaccine has started, and COVID-19 cases have decreased, but people still have to carry out strict health protocols, especially those who have comorbid diabetes mellitus (Soegiarto, 2021). COVID-19 prevention is closely related to knowledge, but facilities from various parties still need to be improved (Samantha & Almalik, 2021).

The approach uses the nursing theory that can be used in health education about the prevention of COVID-19 in diabetes mellitus, namely the Health Promotion Model theory approach. The Health Promotion Model from Nola J Pender is a reference to explore a comprehensive biopsychosocial way to spur an individual desire to perform behavior as an effort to improve health. HPM has three components: characteristics and experiences, cognition and affect, and the result, behavior. According to HPM theory, health behavior is related to the previous behavior, personal factors (biological, psychological, sociocultural), benefits and barriers to action, self-efficacy, attitudes related to activity, interpersonal influences, and situational influences that will affect one's commitment and intense competition and the final choices and behaviors undertaken (Alligood and Tomey, 2006; Pender, Murdaugh and Parsons, 2015). Important components of health services are health promotion, disease prevention, and health maintenance (Anderson & McFarlane, 2007).

2. Methods

This study used a cross-sectional research method where data concerning free el variants and bound el variants were carried out at the same time. The cross-sectional design is carried out by identifying and measuring the achievement of people with diabetes mellitus at one time without follow-up, then linked to personal factors (biological, psychological, sociocultural), perceived action benefit factors, perceived obstacle factors, self-efficacy factors, family support (emotion, instrumental, appreciation, information) By using a research instrument in the form of a questionnaire.

The sampling technique used is probability sampling, which is simple random sampling where samples are randomly selected based on goals or problems in a study. The number of respondents used in this study was 110 respondents. This research was conducted at Al Mustofa Clinic Sarirejo Lamongan.

3. Results

3.1 Characteristics of biological factors

| Characteristics Factor Biological | Frequency | Percentage (%) |
|-----------------------------------|-----------|----------------|
| Age | | |
| 18-25 years | 8 | 7,3% |
| 26-35 years | 16 | 14,5% |
| 26-35 years | 15 | 13,6% |
| 46-55 years old | 12 | 10,9% |

| | | |
|-------------------------------|----|-------|
| 56-65 years | 59 | 53,6% |
| Gender | | |
| Man | 44 | 40% |
| Woman | 66 | 60% |
| Long-suffering from DM | | |
| < 1 year | 52 | 47,3% |
| > 1 year | 58 | 52,7% |
| Other comorbidities | | |
| Exist | 60 | 54,5% |
| None | 50 | 45,5% |

The majority of respondents aged between 56-65 years were 59 respondents (53.6%). Based on gender characteristics, the majority of respondents were female, as many as 66 respondents (60%). Based on the length of suffering from diabetes, the majority suffered from diabetes for more than 1 year, with as many as 58 respondents (52.7%). Based on other comorbidities, the majority of respondents had other comorbidities, as many as 60 respondents (54.5%).

3.2 Previous Behavioral Factors

| Characteristic Factor Previous Behavior | Frequency | Percentage (%) |
|---|-----------|----------------|
| Knowledge | | |
| Low | 70 | 63,6% |
| Tall | 40 | 46,4% |
| Attitude | | |
| Positive | 16 | 14,5% |
| Negative | 94 | 85,5% |
| Action | | |
| Less | 67 | 60,9% |
| Good | 43 | 39,1% |

The majority of respondents had low knowledge, as many as 70 respondents (63.6%). Based on attitude, the majority of respondents had a positive attitude, as many as 94 respondents (85.5%). Based on actions, the majority of respondents had fewer actions, as many as 67 respondents (60.9%).

3.3 Characteristics of psychological factors

| Indicators | Category | Frequency | Percentage (%) |
|-------------|---------------|-----------|----------------|
| Motivation | Low | 13 | 11,8% |
| | Keep | 46 | 41,8% |
| | Tall | 51 | 46,4% |
| Personality | Less | 32 | 29% |
| | Good | 78 | 71% |
| Anxiety | No anxiety | 36 | 32,7% |
| | Light | 28 | 25,4% |
| | Keep | 25 | 22,7% |
| | Heavy | 12 | 10,9% |
| | It's so heavy | 9 | 8,2% |

The majority of respondents had moderate motivation, as many as 46 respondents (41.8%). Based on personality, the majority of respondents have good personalities, as many as 78 respondents (71%). Based on anxiety, the majority of respondents were not anxious, as many as 36 respondents (32.7%).

3.4 Characteristics of sociocultural factors

| Indicators | Category | Frequency | Percentage (%) |
|-------------------|-----------------|------------------|-----------------------|
| Education | SD | 4 | 3,6% |
| | JUNIOR | 40 | 36,3% |
| | SMA | 53 | 48,1% |
| | Bachelor | 13 | 11,8% |
| Norm | Less | 27 | 24,5% |
| | Good | 83 | 75,5% |
| Social networks | Low | 23 | 20,9% |
| | Keep | 55 | 50% |
| | Tall | 32 | 29,1% |

The majority of respondents had a high school education, as many as 53 respondents (48.1%). Based on norms, the majority of respondents have good norms, as many as 83 respondents (75.5%). Based on social networks, the majority of respondents have medium social networks, as many as 55 respondents (50%).

3.5 Characteristics of Cognition and Affection Factors

| Indicators | Category | Frequency | Percentage (%) |
|-------------------|-----------------|------------------|-----------------------|
| Obstacles | Enough | 21 | 19,1% |
| | Less | 60 | 54,5% |
| | Good | 29 | 26,4% |
| Benefit | Enough | 23 | 20,9% |
| | Less | 55 | 50% |
| | Good | 32 | 29,1% |
| Self-efficacy | Enough | 39 | 35,5% |
| | Less | 46 | 41,8% |
| | Good | 25 | 22,7% |

Cognition and affection factors in indicators of barriers, benefits, and self-efficacy; in the indicators of barriers, the majority of respondents were less than 60 respondents (54.5%). Based on the majority benefit, less than 55 respondents (50%). Based on self-efficacy, the majority were less than 46 respondents (41.8%).

3.6 Characteristics of Family Support Factors

| Indicators | Category | Frequency | Percentage (%) |
|-------------------|-----------------|------------------|-----------------------|
| Emotion | Enough | 39 | 35,5% |
| | Less | 46 | 41,8% |
| | Good | 25 | 22,7% |
| Instrumental | Enough | 13 | 11,8% |
| | Less | 46 | 41,8% |
| | Good | 51 | 46,4% |
| Appreciation | Enough | 21 | 19,1% |
| | Less | 60 | 54,5% |
| | Good | 29 | 26,4% |
| Information | Enough | 36 | 32,7% |
| | Less | 25 | 22,7% |
| | Good | 9 | 8,2% |

Family support on the majority emotional indicator was less than 46 respondents (41.8%). Based on instrumentals, the majority were less than 46 respondents (41.8%). Based on the award, the majority were less than 60 respondents (54.5%). Based on the information, the majority was quite 36 respondents (32.7%).

3.7 Behavioral Characteristics of Health Promotion of COVID-19 Prevention in People with Diabetes Mellitus

| Items | Frequency | Percentage |
|----------------------------------|-----------|-------------|
| Y (Covid-19 Prevention Behavior) | Less | 63 57,2% |
| | Good | 47 42,8% |

The descriptive analysis above shows COVID-19 prevention behavior; the majority of respondents are lacking in prevention, as many as 63 respondents (57.2%).

3.8 Test the hypothesis

| Influence | Path coefficient | T statistics | P-Values | Information |
|---|------------------|--------------|----------|---------------|
| Biological Factors -> Cognition and Affection Factors | -0,014 | 0,450 | 0,653 | Insignificant |
| Previous Behavior -> Cognition and Affection Factors | -0,004 | 0,094 | 0,925 | Insignificant |
| Psychological Factors -> Cognition and Affection Factors | 0,988 | 13,095 | 0,000 | Significant |
| Sociocultural Factors -> Cognition and Affection Factors | -0,059 | 0,976 | 0,330 | Insignificant |
| Biological Factors -> Family Support Factors | 0,006 | 0,166 | 0,868 | Insignificant |
| Previous Behavior -> Family Support Factors | 0,022 | 0,390 | 0,697 | Insignificant |
| Psychological Factors -> Family Support Factors | 0,656 | 6,768 | 0,000 | Significant |
| Sociocultural Factors -> Family Support Factors | 0,361 | 3,866 | 0,000 | Significant |
| Cognition and Affection Factors -> COVID-19 Prevention Behavior | 0,373 | 6,676 | 0,000 | Significant |
| Family Support Factors -> COVID-19 Prevention Behaviors | 0,517 | 3,152 | 0,002 | Significant |

4. Discussion

4.1 The Influence of Biological Factors on Cognition and Affection Factors

Based on the study results, valid indicators of biological factors influence cognition and affection factors, namely benefits, barriers, and self-efficacy. According to Ajzen (2015), the perception of self-control can be influenced by personal factors such as personality, emotions, and intelligence; biological factors such as age, gender, and education; while the information factor is in the form of experience, knowledge, and exposure to mass media. Age, type of gender, and level of education are not valid and do not affect cognition and affection factors, where a person's understanding in carrying out COVID-19 prevention behaviors is needed. This study does not follow previous research by Rossaines et al. (2016), which explained that women behave better than men. Another study states that the higher the level of education, the better the behavior (Zatihulwani et al., 2021).

As a person gets older, he will have a mentality and way of thinking that is getting more mature. However, the results showed that most patients were 56-65 years old, the majority had attitudes toward negative behavior, and perceptions of self-control were

lacking. Niven (2000) states that older age will be more isolated and experience a decline in social functions such as intellectual, memory, and problem-solving skills. Memory impairment affects the ability to perform certain behaviors.

4.2 The Influence of Previous Behavior on Cognition and Affection Factors

This study's previous behaviors were related to knowledge, attitudes, and actions. The results of this study showed that previous behavior was invalid and had no effect on cognition and affection factors. This is not in line with Lestarina's research (2018), where there is an influence of knowledge and attitudes toward the behavior of people with diabetes mellitus. Knowledge is the result of a person's curiosity that occurs through the process of the five senses. The factors that affect knowledge are the person who grows up. The more life experience, the higher the knowledge also affects (Zatihulwani et al., 2021).

Someone who has good knowledge about Covid-19 prevention can have a good self-response in efforts to prevent Covid-19. When a person knows the benefits of prevention, he will have a positive belief, to does. Good knowledge can be the basis of a patient's beliefs about the benefits of performing certain behaviors.

4.3 The Influence of Psychological Factors on Cognition and Affection Factors

Psychological factors in this study are motivation, personality, and anxiety. The results of this study show that psychological factors are valid and influential on cognition and affection. This is in line with other studies that explain that anxiety is a negative reaction to threatening and unpredictable situations such as Covid-19. Actions related to psychology, such as anxiety, reduced productivity, and interpersonal conflicts (Rosyanti & Hadi, 2020).

Other studies explain the importance of motivation and understanding so that the individual can apply new behaviors (Ulva & Yanti, 2021). The problem with the general public is that many still need to understand the prevention of COVID-19 transmission. The habit of applying clean and healthy living behavior is not easy, and it requires understanding and desires from individuals to be more disciplined in applying new behaviors.

4.4 The Influence of Sociocultural Factors on Cognition and Affection Factors

Sociocultural factors in this study are education, norms, and social networks. The results showed no valid or no effect on cognition and affection factors. Experience, knowledge, and mass media Ajzen (2015) can influence subjective norm factors and social networks. Someone who interacts a lot with their environment can increase their knowledge. Sources of information can be obtained in the form of print, mass media, or electronic media.

A person's level of education also influences attitudes toward acceptance, information, and life values. Most of the respondents in the study had a high school education level. Respondents with higher levels of education had attitudes toward behaviors, norms, and perceptions of self-control that were lacking, and respondents in the study were most knowledgeable about prevention. This shows that someone with high formal education in one field does not necessarily master others. Information factors for preventing COVID-19 through education from family and information media affect attitudes, norms, and perceptions of self-control. Education is the basis of man for his life guidelines can be used to obtain information. Generally, the higher a person's education, the easier it is to receive information. (Zatihulwani et al., 2021).

4.5 Influence of Biological Factors on Family Support Factors

In the results of this study, the influence of biological factors on family support shows that it is invalid or has no effect. This is similar to other research explaining the desire for treatment for adolescents and adults is not much different or almost the same. This is because a person's motivation cannot be determined by age. Motivation depends on each individual and the information obtained, where understanding from each age varies (Paso et al., 2021). In terms of gender, in line with Zhong's research (2020), it is explained that men have a 1.37 greater risk of poor COVID-19 prevention behavior than women.

4.6 The Effect of Previous Behavior on Family Support Factors

In the results of this study, the influence of previous behavior on family support shows that it is invalid or has no effect. This is not in line with the results of other studies that explain that COVID-19 prevention efforts require the role of support from family members (Alvita et al., 2021). Support provided by the family includes instrumental support, information support, emotion, and appreciation; family members are required to prepare handwashing equipment using soap or hand sanitizer, wear masks at home, provide balanced nutritional meals to improve health stem immune, and regularly invite for exercise. In addition, families are also required to remind each other to carry out health protocols and always give praise and appreciation to families who always comply with COVID-19 health protocols.

4.7 Influence of Psychological Factors on Family Support Factors

In the results of this study, the influence of psychological factors on family support shows that it is invalid or has no effect. This is because a person's motivation cannot be determined by others. Information obtained where responses and understanding from each age vary (Paso et al., 2021). As a person gets older, he will have a mentality and way of thinking that is getting more mature. However, the results showed that most of the patients were in the age range of 56-65 years, and the majority had attitudes toward negative behavior and perceptions of self-control that were lacking.

4.8 The Influence of Sociocultural Factors on Family Support Factors

In the results of this study, the influence of sociocultural factors on family support shows that it is valid or influential. Research by Akari et al. (2018) shows that the subjective norms of diabetes mellitus patients are influenced by family roles. Respondents need information about preventing COVID-19 in people with diabetes mellitus to improve their abilities. In addition, the shape of individual behavior is influenced by social networks, one of which is from friends. Information from the social environment is needed to improve patient behavior in efforts to prevent COVID-19 in diabetes mellitus. Education level also affects family support. If the level of education and knowledge is good, then the behavior will also be good. This research is also in line with research conducted by (Zhong BL et al., March 15, 2020).

4.9 The Effect of Cognition and Affection on COVID-19 Prevention Behavior in People with Diabetes Mellitus

The cognition and affection factors referred to in this study are the perception of benefits, obstacles, and self-efficacy. The prevention behavior of COVID-19 in people with diabetes mellitus in the study in question is implementing health protocols, maintaining diet, exercising, managing stress, and checking sugar regularly. The results of this study on the influence of cognition and affection on COVID-19 prevention behavior in people with diabetes mellitus show that it is valid or influential. This is in line with other studies that explain that perceptions of benefits and barriers have a significant relationship with COVID-19 preventive behavioral measures (Sartika & Akbar, 2021).

COVID-19 prevention behavior occurs due to the formation of an understanding of the dangers and benefits of COVID-19. Knowledge of the benefits of avoiding COVID-19 predisposes a person to take preventive measures. People who know the dangers and vulnerabilities of being infected with COVID-19 will tend to take preventive behaviors. Obstacles felt by respondents, such as lack of information related to the prevention of COVID-19 in people with diabetes mellitus. Knowledge formed in the community can occur due to socialization about the dangers and ways of transmission of COVID-19. This socialization is an effort to form COVID-19 prevention measures for people with diabetes mellitus.

Another study explains that someone who knows the impact of COVID-19 will be able to implement COVID-19 prevention behaviors (Prastyawati et al., 2021). Confidence in a person's ability to implement preventive behavior results from one's thinking about the importance of COVID-19 prevention behavior. This depends on high and low self-willpower.

4.9 The Effect of Family Support Factors on COVID-19 Prevention Behavior in People with Diabetes Mellitus

Family support factors in this study were emotional support, instrumental support, reward support, and information support. Based on the results of the study shows that family support factors have valid results or influence the prevention behavior of COVID-19 in people with diabetes mellitus. Family is the closest part of a person's life. This is in line with other studies that explain that family support has a significant relationship with COVID-19 prevention behavior (Violita & Akbar Nurdin, 2021). The influence of family support is a driver in implementing COVID-19 prevention behaviors. Other studies say support from the family has an important role to play in improving COVID-19 prevention behaviors.

The majority of respondents described receiving good support from family. The family always reminds respondents to wash their hands and, when leaving the house, to use masks, keep their distance, and bring hand sanitizer.

In addition, encouragement from families to join the vaccination program is quite good. The role of the family is significant in implementing health protocols to prevent COVID-19. The Masa pandemic caused most activities to be concentrated from their respective homes.

Therefore, family support plays a significant role in maintaining and improving COVID-19 prevention behaviors, especially in people with comorbid diabetes mellitus. Research from Hla et al. (2018), diabetes mellitus patients with optimal family support adhere to treatment and prevention therapeutically.

Family plays a role in prevention, including implementing a diet for people with diabetes mellitus. Optimal family support can improve the subjective norms of diabetes mellitus patients in diet management (Gatt & Sammut, 2008). Active involvement of families in COVID-19 prevention behaviors can increase prevention efforts, as expected by people who are considered essential roles, such as families, to carry out COVID-19 prevention. Kristianingrum and Budiyan (2011) stated that family support significantly influences adherence to medication for diabetes mellitus. Family plays an essential role in prevention efforts. The availability of family support in providing optimal facilities, emotional support, information, and rewards is a supporting factor for individuals in improving their behavior in preventing COVID-19 in people with diabetes mellitus.

5. Conclusion

Psychological factors, namely a person's motivation, personality, and anxiety about the transmission of the COVID-19 virus, affect cognition and affection factors. Motivation, and good personality, and low anxiety will affect the way a person thinks about the perception of new conditions. In addition, psychological factors also affect family support factors, where motivation and a good personality can affect a person's thinking that the family, as the closest person, provides support in every circumstance. Sociocultural factors that include education, norms, and social networks influence family support invoices. Education will affect a person's level of knowledge, so families also play a role in providing good support, one of which is information about COVID-19 prevention. Good norms and social networks will also significantly impact people with diabetes in getting information. The cognition and affection factors, namely barriers, benefits, and self-efficacy, influence health promotion behavior in preventing COVID-19. A person's perception of benefits, barriers, and self-efficacy can affect prevention behavior. COVID-19 prevention behavior is formed because of knowledge and understanding of the benefits of implementing COVID-19 prevention, knowing what obstacles are faced, and one's ability to implement COVID-19 prevention behavior in people with diabetes mellitus. Family support factors, including emotional, instrumental, reward, and information support, influence COVID-19 prevention behavior in people with diabetes mellitus. The influence of family support is a driver in implementing COVID-19 prevention behaviors. Good family support plays a role in implementing health protocols. Family involvement is necessary for people with diabetes mellitus to implement COVID-19 prevention behaviors in people with diabetes mellitus. COVID-19 prevention behaviors in people with diabetes include health protocols, maintaining a diet (diet), exercising, managing stress, and checking sugar regularly.

Funding: This research received no external funding.

Conflicts of Interest: The authors declare no conflict of interest.

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References

- [1] Alvita, G. W., Hartini, S., Winarsih, B. D., & Faidah, N. (2021). Pemberdayaan Dukungan Keluarga Dalam Meningkatkan Pemahaman Pencegahan Covid-19 Di Masyarakat Kabupaten Demak. *Jurnal Pengabdian Kesehatan*, 4(1), 10–20. <http://jpk.jurnal.stikescendekiautamakudus.ac.id>
- [2] Gazzaz, Z. J. (2021). Diabetes and COVID-19. *Open Life Sciences*, 16(1), 297–302. <https://doi.org/10.1515/biol-2021-0034>
- [3] Jeong, I. K., Yoon, K. H., & Lee, M. K. (2020). Diabetes and COVID-19: Global and regional perspectives. *Diabetes Research and Clinical Practice*, 166, 108303. <https://doi.org/10.1016/j.diabres.2020.108303>
- [4] Kemenkes (2018). Kementerian Kesehatan Republik Indonesia. In Kementerian Kesehatan RI (Vol. 1, Issue 1, p. 1). <https://www.kemkes.go.id/article/view/19093000001/penyakit-jantung-penyebab-kematian-terbanyak-ke-2-di-indonesia.html>
- [5] Kementerian Kesehatan Republik Indonesia. (2020). Situasi Terkini Perkembangan (COVID-19). Kemenkes, September, 17–19. https://covid19.kemkes.go.id/download/Situasi_Terkini_050520.pdf
- [6] Marhl, M., Grubelnik, V., Magdič, M., & Markovič, R. (2020). Diabetes and metabolic syndrome as risk factors for COVID-19. *Diabetes and Metabolic Syndrome: Clinical Research and Reviews*, 14(4), 671–677. <https://doi.org/10.1016/j.dsx.2020.05.013>
- [7] Octafia, L. A. (2021). Vaksin Covid-19: Perdebatan, Persepsi dan Pilihan. *Emik*, 4(2), 160–174. <https://doi.org/10.46918/emik.v4i2.1134>
- [8] Pal, R., & Bhadada, S. K. (2020). COVID-19 and diabetes mellitus: An unholy interaction of two pandemics. *Diabetes and Metabolic Syndrome: Clinical Research and Reviews*, 14(4), 513–517. <https://doi.org/10.1016/j.dsx.2020.04.049>
- [9] Paso, A. B., Dion, Y., & Paulus, A. Y. (2021). Faktor-Faktor Yang Mempengaruhi Dukungan Keluarga Terhadap Motivasi Berobat Penderita Kusta Di Wilayah Kerja Puskesmas Se-Kota Kupang. Hubungan Pengetahuan Dan Sikap Dengan Tindakan Pencegahan APenditis Pada Masyarakat Di Kampung Jagangara Wilayah Kerja Puskesmas Weekarou Kabupaten Sumba Barat, 4, 41–47.
- [10] Prastyawati, M., Fauziah, M., Ernyasih, Romdhona, N., & Herdiansyah, D. (2021). Faktor-faktor yang Berhubungan dengan Perilaku Pencegahan COVID-19 Mahasiswa FKM UMJ pada Pandemi COVID-19 Tahun 2020. *AN-NUR: Jurnal Kajian Dan Pengembangan Kesehatan Masyarakat*, 1(2), 173–184.
- [11] Rejeki, A. S., & Rahman, S. (1993). Hubungan Tingkat Pengetahuan Dan Sikap Peserta Prolanis Diabetes Mellitus Tipe 2 Terhadap Kepatuhan Protokol Kesehatan Covid - 19 Di Klinik Iman. *Jurnal Ilmiah Maksitek*, 45(Supplement), S-102.
- [12] Rosyanti, L., & Hadi, I. (2020). Dampak Psikologis dalam Memberikan Perawatan dan Layanan Kesehatan Pasien COVID-19 pada Tenaga Profesional Kesehatan. *Health Information: Jurnal Penelitian*, 12(1), 107–130. <https://doi.org/10.36990/hijp.vi.191>

- [13] Samantha, R., & Almalik, D. (2021). Tingkat Pengetahuan Terhadap Pencegahan Covid-19 Pada Peserta Prolanis Diabetes Melitus Tipe 2 di Klinik Iman. *Jurnal Ilmiah Maksitek*, 6(2), 58–66. <http://www.tjyybjb.ac.cn/CN/article/downloadArticleFile.do?attachType=PDF&id=9987>
- [14] Sartika, U., & Akbar, S. (2021). Hubungan Persepsi Masyarakat Terhadap Tindakan Pencegahan Covid-19 Di Desa Bangun Rejo Dusun Iii Tanjung Morawa. *Jurnal Kedokteran Ibnu Nafis*, 9(2), 65–70. <https://doi.org/10.30743/jkin.v9i2.90>
- [15] Shi, Z., Yan, A., Zimmet, P., Sun, X., Cristina Do Vale Moreira, N., Cheskin, L. J., Wang, L., Qu, W., Yan, H., Hussain, A., & Wang, Y. (2021). COVID-19, Diabetes, and Associated Health Outcomes in China: Results from a Nationwide Survey of 10 545 Adults. *Hormone and Metabolic Research*, 53(5), 301–310. <https://doi.org/10.1055/a-1468-4535>
- [16] Simanjuntak, G. V., Simamora, M., & Sinaga, J. (2020). Optimalisasi Kesehatan Penyandang Diabetes Melitus Tipe II Saat Pandemi Covid-19. *Journal of Community Engagement in Health*, 3(2), 171–175. <https://doi.org/10.30994/jceh.v3i2.59>
- [17] Soegiarto. (2021). Respons imun terhadap vaksin COVID-19 dan komorbid sebagai pertimbangan kehati-hatian Topik bahasan. *Statistika*, B. P. (2019). Katalog: 4201005. Profil Statistik Kesehatan, 1–37.
- [18] Taye, G. M., Bose, L., Beressa, T. B., Tefera, G. M., Mosisa, B., Dinsa, H., Birhanu, A., & Umata, G. (2020). COVID-19 knowledge, attitudes, and prevention practices among people with hypertension and diabetes mellitus attending public health facilities in Ambo, Ethiopia. *Infection and Drug Resistance*, 13, 4203–4214. <https://doi.org/10.2147/IDR.S283999>
- [19] Ulva, F., & Yanti, M. (2021). Edukasi Dampak Psikologis Covid-19 pada Masyarakat di Wilayah Kerja Puskesmas Dadok Tunggul Hitam. *Jurnal Abdidas*, 2(2), 352–356. <https://doi.org/10.31004/abdidas.v2i2.288>
- [20] Violita, F., & Akbar Nurdin, M. (2021). Dukungan Sosial Perilaku Pencegahan Covid-19 pada Mahasiswa Kesehatan Kota Jayapura. *Media Publikasi Promosi Kesehatan Indonesia (MPPKI)*, 5(1), 44–49. <https://doi.org/10.56338/mppki.v5i1.1810>
- [21] WHO. (2021). COVID-19 Weekly Epidemiological Update 35. World Health Organization, December, 1–3. https://www.who.int/docs/default-source/coronaviruse/situation-reports/weekly_epidemiological_update_22.pdf
- [22] Zatihulwani, E. Z., Sari, G. M., & Rozi, F. (2021). Pengetahuan dan Perilaku Pencegahan Covid-19 pada Penderita Diabetes Mellitus. *Jurnal Penelitian Kesehatan Suara Forikes*, 12(November), 121–125.
- [23] Zhou, F., Yu, T., Du, R., Fan, G., Liu, Y., Liu, Z., Xiang, J., Wang, Y., Song, B., Gu, X., Guan, L., Wei, Y., Li, H., Wu, X., Xu, J., Tu, S., Zhang, Y., Chen, H., & Cao, B. (2020). Clinical course and risk factors for mortality of adult inpatients with COVID-19 in Wuhan, China: a retrospective cohort study. *The Lancet*, 395(10229), 1054–1062. [https://doi.org/10.1016/S0140-6736\(20\)30566-3](https://doi.org/10.1016/S0140-6736(20)30566-3)