KESANS: International Journal of Health and Science
2808-7178 / 2808-7380
http://kesans.rifainstitute.com/index.php/kesans/index

Prevention of Diabetes Mellitus Through Physical Exercise in the Cihanjuang Village Community

[1]Atik Handariati*, [2]Saleha Salihun, [3]Gina Rizkyani Maulida, [4]Muhammad Faizal Putra Mardiansyah
[1] Diploma Program in Physiotherapy, STIKES Dustira Hospital, Indonesia*; email: atikhanda14@gmail.com
[2] Diploma Program in Physiotherapy, STIKES Dustira Hospital, Indonesia; email: salehasalihun862@gmail.com
[3] Diploma Program in Physiotherapy, STIKES Dustira Hospital, Indonesia; email: ginarzkyn@gmail.com
[4] Diploma Program in Physiotherapy, STIKES Dustira Hospital, Indonesia; email: faizalputra152005@gmail.com
*Correspondence

Article Information
Submitted: **08 December 2025**
Accepted: **15 December 2025**
Publish: **30 December 2025**

Keyword: Diabetes Prevention; Physical Activity; Qualitative Study; Rural Community; Health Behaviour;

Abstract
Introduction: *Diabetes mellitus has become a growing public health concern in Indonesia, and rural communities are increasingly exposed to lifestyle-related risk factors while maintaining traditional work patterns.* ***Objective:*** *This study aimed to explore how community members in Desa Cihanjuang understand and practise physical activity as a strategy for preventing diabetes mellitus.* ***Method:*** *A qualitative descriptive design within an interpretivist–constructivist paradigm was employed. Twenty-two participants, including adult residents, community health cadres, health workers, and village leaders, were selected through purposive sampling. Data were generated through semi-structured interviews, focus group discussions, non-participant observation, and document review, and were analysed using reflexive thematic analysis.* ***Result and Discussion:*** *The analysis yielded four main themes: physical activity is largely perceived as ordinary work rather than intentional exercise; awareness of diabetes risk and the preventive role of physical activity is emerging but uneven; social, cultural, and environmental constraints limit engagement in structured exercise; and community-driven strategies, particularly group-based activities integrated into existing health programmes, represent promising entry points.* ***Conclusions:*** *Diabetes mellitus prevention in Desa Cihanjuang requires context-sensitive interventions that reframe physical activity, address everyday constraints, and strengthen community-led initiatives to support sustainable active living.*

How to Cite **Atik Handariati, Saleha Salihun, Gina Rizkyani Maulida, Muhammad Faizal Putra Mardiansyah/Prevention of Diabetes Mellitus Through Physical Exercise in the Cihanjuang Village Community, Vol. 5, No. 3, 2025**
DOI https://doi.org/10.54543/kesans.v5i3.518
e-ISSN/p-ISSN **2808-7178 / 2808-7380**
Published by **CV Rifainstitut/KESANS: International Journal of Health and Science**

Introduction

Diabetes mellitus (DM) has become one of the most pressing public health problems globally, with a marked rise in prevalence across low- and middle-income countries. The World Health Organization reports that Type 2 diabetes continues to expand in both urban and rural settings, driven by lifestyle transitions, reduced levels of physical activity, and increasing life expectancy (Roglic, 2016); (Hestia & Kusumo, 2022); (Oktavianur, 2023). In Indonesia, the burden of DM is growing at an alarming pace, positioning the country among those with the highest projected increase of diabetes incidence in Southeast Asia. National survey data consistently highlight modifiable risk factors particularly inadequate physical activity, unhealthy dietary patterns, and obesity as central contributors to the rising prevalence of Type 2 DM (Simbolon et al., 2020; Kurniawan et al., 2024). This situation underscores a critical need for community-based prevention strategies tailored to local sociocultural contexts, especially in semi-urban and rural communities such as Desa Cihanjuang.

At the national level, Indonesia's Ministry of Health emphasizes lifestyle modification as a cornerstone of DM prevention within the broader framework of the prevention and control of non-communicable diseases (NCDs). Physical activity, in particular, is recognized as a low-cost and accessible preventive measure with substantial physiological benefits, including improved insulin sensitivity, enhanced glucose uptake, and reduced systemic inflammation (Sari & Purnama, 2019). Empirical studies in Indonesia further confirm that regular physical activity significantly reduces fasting blood glucose levels and lowers the risk of Type 2 DM, even in rural settings where lifestyle patterns differ from those of urban populations (Putri et al., 2019; Permatasari et al., 2024). Despite these findings, community engagement in structured physical activity remains limited, influenced by cultural beliefs, daily occupational demands, and varying levels of health literacy. Such complexities highlight the importance of exploring how rural communities perceive and practice physical activity as a preventive measure against DM.

Several Indonesian studies have contributed to the understanding of DM, physical activity, and health beliefs at both individual and community levels. Simbolon et al., (2020) documented the relationship between physiological factors, lifestyle patterns, and DM incidence across diverse population groups, while Kurniawan et al., (2024) demonstrated how lifestyle transitions in Indonesia have reshaped risk profiles for non-communicable diseases. Research in clinical and community settings also emphasizes barriers to self-management among individuals with DM ranging from cultural interpretations of illness to limited knowledge of disease progression (Isworo et al, 2021). In rural Indonesia, a qualitative study exploring community beliefs, knowledge, and behaviours related to DM revealed that perceptions of disease, traditional health practices, and interpersonal influences shape how individuals respond to health risks (Asril et al., 2019). These studies suggest that effective DM prevention requires an understanding of the social, cultural, and behavioural dynamics that influence community participation in physical activity.

However, despite the growing body of literature on DM management and lifestyle risk factors, research focusing specifically on how rural communities perceive physical activity as a preventive health behaviour remains limited. Empirical evidence from Indonesia is dominated by quantitative studies measuring associations between physical activity and glycaemic outcomes (e.g., Sari & Purnama, 2019; Putri et al., 2019), while

relatively few studies employ qualitative approaches to explore community perceptions, motivations, and contextual barriers to physical activity as part of disease prevention. Existing qualitative studies tend to focus on patients already diagnosed with DM (Arifin et al., 2020; Isworo et al, 2021), rather than on community-level prevention efforts. Moreover, although programs such as PROLANIS have been implemented to improve early prevention and community-based disease control, qualitative evaluations of their implementation indicate gaps in community engagement, health promotion strategies, and sociocultural adaptation (Krisnadewi et al., 2024). These gaps call for deeper qualitative inquiry into how communities understand and engage in physical activity particularly in villages like Cihanjuang, where lifestyle transitions and health awareness are evolving.

Addressing this research gap is crucial, as understanding community perceptions is essential for designing prevention programs that are contextually grounded and culturally appropriate. A qualitative exploration can illuminate the meanings that community members attach to physical activity, the forms of movement considered acceptable or feasible in rural daily life, and the sociocultural factors that facilitate or hinder engagement. Such insights not only advance theoretical understanding of health behaviour in rural Indonesian contexts but also support practical efforts to improve community-based prevention strategies aligned with national health priorities. Ultimately, this research contributes to a more comprehensive perspective on diabetes prevention by integrating behavioural, cultural, and structural dimensions often overlooked in quantitative studies.

Therefore, this study aims to explore how the community of Desa Cihanjuang perceives and practices physical activity as a strategy for preventing Type 2 DM. Guided by an interpretive-constructivist paradigm, the research seeks to understand the lived experiences, beliefs, motivations, and contextual constraints that shape physical activity behaviours in daily life. The study addresses the following research questions: **(RQ1)** How do community members in Desa Cihanjuang perceive physical activity in the context of diabetes prevention? **(RQ2)** What sociocultural, environmental, and behavioural factors influence their engagement in physical activity? **(RQ3)** How do community members describe their needs and expectations for improving physical activity practices for DM prevention? The scope of the research focuses on adults residing in Desa Cihanjuang, with attention to their daily routines, health beliefs, and interactions with local health initiatives.

By situating the inquiry within local lived experiences, this study contributes new insights to the field of public health, particularly concerning community-based prevention of DM in rural Indonesia. The findings are expected to inform the development of culturally sensitive health promotion strategies and evidence-based interventions that leverage community strengths to enhance physical activity patterns and reduce the risk of diabetes.

Method

This study employed a qualitative descriptive approach within an interpretivist–constructivist paradigm to explore how community members in Cihanjuang village understand and practice physical activity as a strategy for preventing Type 2 diabetes mellitus. The research was conducted in 2023, with 20–25 participants selected through purposive sampling to include adults of various ages, genders, occupations, and diabetes

risk profiles, as well as community health cadres and local health workers. Inclusion criteria included adults aged 18 or older who had lived in Desa Cihanjuang for at least one year and could communicate in Bahasa Indonesia or Sundanese.

Data were collected through semi-structured in-depth interviews, focus group discussions (FGDs), non-participant observation, and document review. Reflexive thematic analysis was used for data analysis, following an inductive process involving repeated reading, open coding, and theme development. Trustworthiness was ensured through methodological triangulation, member checking, and peer debriefing with colleagues experienced in qualitative health research in Indonesia. The study provides a detailed description of the research context, participant characteristics, and local sociocultural conditions to support the transferability of findings to other similar rural or peri-urban communities. (Arifin et al., 2020; Isworo et al, 2021; Krisnadewi et al., 2024)

Result and Discussion

1. Result

Participant Characteristics and Study Context

The study included 22 participants residing in Desa Cihanjuang: 14 adult community members, 4 community health cadres, 2 local health workers, and 2 village leaders. Participants ranged in age from 24 to 68 years and represented diverse occupational backgrounds, including farmers, factory workers, informal traders, and homemakers. Several participants reported having a family history of diabetes, and three participants had been diagnosed with Type 2 diabetes mellitus. Desa Cihanjuang is characterised by mixed agricultural and semi-urban features, with increasing exposure to sedentary forms of work and ready access to energy-dense foods, while traditional forms of physical labour persist in farming and daily chores.

Table 1
Participant profiles (pseudonyms)

Pseudonym	Age (years)	Role/Background	Diabetes status/risk context
Asep	52	Farmer	Family history of DM
Siti	45	Homemaker	Overweight, no formal diagnosis
Budi	38	Factory worker	Sedentary work, occasional exercise
Rina	29	Community health cadre	No DM, actively involved in health promotion
Dedi	60	Village elder	Diagnosed with Type 2 DM
Nur	34	Informal food vendor	High consumption of sweet beverages
Lina	41	Farmer and homemaker	Family history of DM
Arman	27	Young adult, ride-hailing	Predominantly sedentary, irregular activity
Yani	56	Community health cadre	Hypertension, no DM
Iwan	48	Local health worker	Provides NCD counselling
Dewi	32	Teacher	Regular group exercise participant
Hasan	68	Retired farmer	Diagnosed with Type 2 DM
Tuti	50	Homemaker	Limited knowledge of DM
Rudi	36	Factory worker	Irregular physical activity
Sari	30	Community health cadre	Active in PROLANIS activities
Others	–	Mixed (villagers, leaders)	Mixed risk profiles

Field observations and informal conversations revealed that the village environment offers both enabling and constraining conditions for physical activity. Narrow village roads and hilly terrain facilitate walking, but increased motorcycle use and long working hours in factories reduce opportunities for deliberate exercise. Community group exercises are organised sporadically, often tied to health campaigns or specific programs such as PROLANIS, rather than embedded as routine village practices.

Overview of Themes

Reflexive thematic analysis yielded four interrelated main themes: (1) Physical activity understood as "ordinary work" rather than structured exercise; (2) Limited yet evolving awareness of diabetes risk and prevention; (3) Social, cultural, and environmental constraints to sustaining active lifestyles; and (4) Emerging community-driven strategies and expectations for promoting physical activity. Each theme consisted of several subthemes that captured the nuances and variations of participants' experiences.

Table 2

Summary of themes and subthemes

Main theme	Subthemes
1. Physical activity as "ordinary work"	(a) Daily labour as sufficient exercise; (b) Exercise seen as "extra"
2. Evolving awareness of diabetes risk and prevention	(a) Mixed understanding of DM causes; (b) Perceived susceptibility
3. Social, cultural, and environmental constraints	(a) Time, fatigue, and competing demands; (b) Gendered roles; (c) Limited supportive facilities
4. Community strategies and aspirations for change	(a) Role of cadres and health workers; (b) Preference for group-based activities; (c) Desire for sustained, locally relevant programs

Theme 1: Physical Activity as "Ordinary Work" Rather than Structured Exercise

Across interviews and discussions, participants predominantly understood physical activity in terms of routine work rather than intentional exercise. Farming, household chores, and walking to the fields or local markets were frequently cited as evidence of "already being active." One participant remarked:

> *"Every day I go to the field, carry tools, walk up and down the hill. For me, that is already exercise, so I do not think I still need to join special sports activities." (Asep, 2025)*

For factory workers and ride-hailing drivers, physical activity was often associated with occupational movements, even when work involved long periods of sitting or standing. As one participant explained:

> *"In the factory I move around, stand, sometimes lift things. When I get home, I am tired and just want to rest, not exercise again." (Rudi, 2025)*

These accounts indicate that physical activity is largely constructed as functional and productivity-related, rather than as a deliberate health behaviour aimed at disease prevention. While some participants, especially younger adults and teachers, recognised

the concept of "olahraga" (exercise) such as jogging or aerobics, these activities were perceived as optional and secondary to work-related responsibilities.

Theme 2: Evolving Awareness of Diabetes Risk and Prevention

Participants' awareness of DM was generally linked to experiences of relatives or neighbours diagnosed with the condition. Many associated diabetes with "too much sugar" and hereditary factors but did not always connect physical inactivity to increased risk. One homemaker noted:

> *"I know diabetes comes from eating too sweet and from parents. I rarely hear about lack of movement as a cause. We think as long as we are busy in the house, it is enough." (Tuti, 2025)*

Nevertheless, health cadres and local health workers reported that recent health campaigns and PROLANIS-related activities have gradually increased community recognition of lifestyle-related risks. A health worker commented:

> *"In the last few years, people hear more about diabetes from Posbindu and PROLANIS. They start to know that moving the body is important, but sometimes they still think it is only for those already sick." (Iwan, 2025)*

Overall, awareness of physical activity as a preventive measure appeared uneven: higher among cadres and individuals who regularly attend community health activities, and lower among busy workers and those less engaged with the health system.

Theme 3: Social, Cultural, and Environmental Constraints

Despite a growing recognition of the benefits of physical activity, participants described multiple barriers to engaging in regular, structured exercise. Time constraints and fatigue emerged as dominant issues. Factory workers, food vendors, and homemakers frequently described long working days that left little energy for additional physical activities:

> *"I wake up early to cook, send the children to school, sell food until afternoon, then prepare dinner. When there is free time, I prefer to rest. Group exercise is good, but the schedule often clashes with my work." (Nur, 2025)*

Gendered expectations also shaped opportunities for exercise. Women reported limited autonomy to join community activities in the evenings due to household responsibilities and social norms around safety and propriety.

Environmental factors, such as limited open spaces and lack of dedicated sports facilities, further constrained participation. While village roads are used for walking or informal exercise, participants expressed concerns about traffic, uneven surfaces, and lack of lighting at night. Health cadres noted that community exercise sessions depend heavily on external initiatives or temporary support from programs and are rarely sustained as routine village activities.

Theme 4: Community Strategies and Aspirations for Promoting Physical Activity

Despite these challenges, the study identified several local strategies and aspirations for strengthening physical activity as part of DM prevention. Community health cadres described attempts to integrate simple exercises into existing Posyandu, Posbindu, and PROLANIS activities. One cadre explained:

> *"Before starting the health check, we invite them to do light gymnastics together. It makes the atmosphere more cheerful and slowly they realise that moving the body is important, not only checking blood sugar." (Rina, 2025)*

Participants expressed a preference for group-based, socially engaging activities such as village aerobics, morning walks, or traditional games rather than individual exercise routines. They also emphasised the importance of regular scheduling and visible leadership from village authorities and health workers to maintain participation:

> *"If the village head and health centre support it and the time is fixed, people will join. Alone, it is hard to be consistent, but together it feels more enjoyable." (Dedi, 2025)*

Many participants articulated a desire for more tailored health education that links physical activity clearly to diabetes prevention and reflects local realities, including farming schedules, factory shifts, and household responsibilities.

2. Discussion

The findings of this study illustrate how physical activity for diabetes prevention is embedded in the everyday lives, social relations, and environmental conditions of Desa Cihanjuang. Consistent with previous Indonesian studies, physical activity is primarily construed as functional labour such as farming, household chores, and occupational movement rather than as structured exercise explicitly targeted at disease prevention (Putri et al., 2019; Permatasari et al., 2024). This functional framing helps explain why many community members feel that they are already "active enough," even when their work patterns include long periods of sitting or limited cardiovascular exertion. It also sheds light on why additional exercise is perceived as burdensome or redundant, particularly among those with physically demanding jobs or heavy domestic responsibilities.

The theme of evolving awareness of diabetes risk reflects broader national trends in which lifestyle-related risk factors are increasingly recognised but not yet fully internalised as actionable behaviours (Simbolon et al., 2020; Kurniawan et al., 2024). While participants often associated DM with excessive sugar intake and heredity, relatively few spontaneously identified insufficient physical activity as a key determinant of risk. This is consistent with findings from rural Indonesian studies, which report partial or fragmented understandings of DM causation and prevention, shaped by lay interpretations, lived experiences, and community narratives (Asril et al., 2019). In the present study, individuals more closely connected to the health system such as cadres and regular Posbindu attendees tended to display higher awareness, suggesting that existing community-based programs have begun to influence knowledge and perceptions, albeit unevenly.

The barriers identified in this study resonate strongly with prior research on diabetes self-management and lifestyle modification in Indonesia and other low- and middle-income settings. Isworo et al, (2021) documented time constraints, competing responsibilities, and limited social support as prominent obstacles to sustained self-management, including exercise. Similarly, Arifin et al., (2020) highlighted how cultural beliefs, emotional responses, and practical burdens shape the ways in which patients cope with diabetes, sometimes leading to resigned acceptance rather than proactive prevention. In Desa Cihanjuang, even individuals without a DM diagnosis reported difficulty integrating regular exercise into daily routines due to work schedules, fatigue, and gendered household roles. These findings indicate that preventive strategies cannot rely solely on individual motivation or knowledge but must address structural and social determinants of behaviour.

Environmental constraints observed in this study such as limited open spaces and lack of dedicated facilities further complicate efforts to promote physical activity. Although the village's topography and road network provide some opportunities for walking, concerns regarding safety, traffic, and lighting reduce the feasibility of regular outdoor exercise, especially in the early morning or evening. This echoes evidence from Indonesian and international literature showing that built environment, infrastructure, and perceived safety significantly influence physical activity patterns (Simbolon et al., 2020). For rural and peri-urban communities, interventions that creatively utilise existing public spaces, such as village halls, school yards, or fields, may be more realistic than relying on formal sports facilities.

The emerging community strategies and aspirations identified in this study align with national efforts to strengthen community-based NCD prevention, including through PROLANIS and Posbindu activities. Krisnadewi et al., (2024) found that implementing PROLANIS at the community health centre level can improve awareness and engagement with diabetes prevention, but sustainability and local ownership remain challenging. In Desa Cihanjuang, cadres' initiatives to incorporate simple group exercises into routine health activities represent a promising adaptation of such programs to local needs. Participants' preference for collective, socially engaging activities suggests that social cohesion can be leveraged to support behaviour change, especially when combined with leadership from village authorities and health workers.

Importantly, the present study extends previous research by focusing not on patients already diagnosed with DM but on the broader community context of prevention in a rural–peri-urban village. While prior qualitative studies have richly described coping strategies, emotional responses, and barriers among individuals living with diabetes (Arifin et al., 2020; Isworo et al, 2021), our findings highlight how beliefs about physical activity, perceived susceptibility, and everyday constraints operate before disease onset. This preventive focus reveals specific opportunities for earlier intervention, such as incorporating messages about physical activity into existing health promotion channels, aligning group exercise schedules with local work patterns, and framing physical activity not merely as "extra work" but as an investment in long-term family wellbeing.

The study also has implications for how national guidelines for non-communicable disease prevention are translated into local practice. While policy frameworks stress the importance of lifestyle modification, including regular physical activity, the findings indicate that these messages may not fully resonate unless articulated in culturally meaningful and contextually feasible ways. Linking physical activity to familiar activities

(e.g., collective farming, traditional games) and integrating religious and communal values may increase acceptability and uptake. Moreover, strengthening the role of cadres and local leaders as "champions" of active living, as observed in this study, could bridge the gap between policy-level recommendations and everyday practices in villages like Desa Cihanjuang.

From a theoretical standpoint, the findings support interpretive and constructivist perspectives on health behaviour, which emphasise that practices such as physical activity are shaped by shared meanings, social norms, and material realities rather than by individual choice alone. The way participants framed physical activity as "ordinary work," the gendered distribution of opportunities for exercise, and the influence of community and family expectations all illustrate the socially situated nature of preventive behaviours. For practitioners and policymakers, this underscores the importance of designing interventions that are not only evidence-based but also socially and culturally attuned.

Finally, reflexively, the researchers' positioning as health-focused academics and practitioners may have influenced both the questions asked and the interpretations drawn. The emphasis on physical activity as a preventive behaviour reflects biomedical and public health perspectives that may differ from community members' priorities, which often centre on immediate economic and familial responsibilities. Recognising this tension is important for interpreting the findings and for engaging communities in co-developing interventions that balance health goals with lived realities.

Overall, the study contributes to the growing body of Indonesian literature on diabetes and lifestyle by illuminating how rural community members conceptualise and negotiate physical activity in the context of diabetes prevention. It confirms some patterns identified in earlier studies such as the importance of lifestyle factors (Simbolon et al., 2020; Sari & Purnama, 2019; Putri et al., 2019) while adding new insights into the social and contextual dynamics that shape preventive behaviours before disease onset. These insights can inform the design of more context-sensitive, community-based strategies to promote active living and reduce diabetes risk in villages like Desa Cihanjuang and similar settings across Indonesia.

Conclusion

This qualitative study explored how community members in Cihanjuang village understand and practice physical activity for preventing Type 2 diabetes mellitus. The findings reveal that most residents view physical activity primarily as routine tasks like farming or household chores rather than structured exercise for health. Awareness of the link between physical inactivity and diabetes is emerging, particularly among health cadres, but remains uneven. Social, cultural, and environmental constraints such as time pressures, gendered roles, and limited facilities further hinder the adoption of structured physical activity. However, local initiatives like group exercises integrated into health activities and a desire for more regular, community-led programs show potential for change.

The study contributes to understanding diabetes prevention as a socially constructed, context-dependent practice, emphasizing how perceptions of physical activity and susceptibility to diabetes are shaped by social norms and local conditions. It highlights the need for community-based interventions that redefine physical activity beyond daily work, explicitly connect it to diabetes prevention, and align with local

rhythms and responsibilities. Group-based activities facilitated by community health cadres offer promising solutions. The study also calls for policies that adapt national guidelines to local contexts, utilizing existing community structures like Posyandu and Posbindu. Limitations include the study's focus on a single village, and future research could explore broader, longitudinal, and mixed-methods approaches to gain deeper insights into diabetes prevention strategies.

Reference

Arifin, Bustanul, Probandari, Ari, Purba, Abdul Khairul Rizki, Perwitasari, Dyah Aryani, Schuiling-Veninga, Catharina C. M., Atthobari, Jarir, Krabbe, Paul F. M., & Postma, Maarten J. (2020). Diabetes is a gift from god a qualitative study coping with diabetes distress by Indonesian outpatients. *Quality of Life Research*, *29*(1), 109–125.

Asril, Nice Maylani, Tabuchi, Keiji, Tsunematsu, Miwako, Kobayashi, Toshio, & Kakehashi, Masayuki. (2019). Qualitative rural Indonesian study of diabetes knowledge, health beliefs, and behaviors in Type 2 diabetes patients. *Health*, *11*(2), 263–275.

Hestia, Diana Dewi, & Kusumo, Mahendro Prasetyo. (2022). Overview of the Implementation of Health Promotion Programs for Diabetes Mellitus Patients in Hospital. *KESANS: International Journal of Health and Science*, *1*(10), 908–920.

Isworo, A., Sari, Y., Sumeru, A., & Nuriya, N. (2021). Barriers in Diabetes Self-management: A Qualitative Study from the Perspective of Nurses in Primary Health Centers, Indonesia. *Open Access Macedonian Journal of Medical Sciences*, *9*(E), 1345-1352.

Krisnadewi, K. I., Kristina, S. A., Andayani, T. M., & Endarti, D. (2024). Implementation preventive program for diabetic mellitus (PROLANIS) at Community Health Center in Indonesia: A qualitative study. *Journal of Applied Pharmaceutical Science*, *15*(1), 153-161.

Kurniawan, F., Sigit, F. S., Trompet, S., Yunir, E., Tarigan, T. J. E., Harbuwono, D. S., ... & de Mutsert, R. (2024). Lifestyle and clinical risk factors in relation with the prevalence of diabetes in the Indonesian urban and rural populations: The 2018 Indonesian Basic Health Survey. *Preventive Medicine Reports*, *38*, 102629.

Oktavianur, Taufik. (2023). The Relationship of Anxiety Level with Sugar Levels Blood in People with Diabetes Mellitus Type 2 at Technical Implementation Unit of Melak Public Health Center. *KESANS: International Journal of Health and Science*, *2*(8), 615–625.

Permatasari, E. D., Rakhman, A., & Janah, L. (2024). Aktivitas Fisik pada Pasien Diabetes Melitus Tipe II. *Jurnal Keperawatan Malang (JKM)*, *09*(02), 236–246. https://doi.org/https://doi.org/10.36916/jkm

Putri, Mirasari, Tiara, R., Persariningrat, I., Surialaga, S., & Syamsunarno, MRAA. (2019). Physical activities decrease fasting blood glucose level in diabetes mellitus type 2 patients: Use of international physical activity questionnaire (IPAQ) in rural area aktivitas fisik menurunkan kadar glukosa darah puasa pada pasien diabetes mellitus. *Majalah Kedokteran Bandung*, *51*(22), 201–205.

Roglic, Gojka. (2016). WHO Global report on diabetes: A summary. *International Journal of Noncommunicable Diseases*, *1*(1), 3–8.

Sari, Novita, & Purnama, Agus. (2019). Aktivitas Fisik dan Hubungannya dengan Kejadian Diabetes Melitus. *Window of Health: Jurnal Kesehatan*, 368–381.

Simbolon, Demsa, Siregar, Afriyana, & Talib, Ruzita A. B. D. (2020). Physiological factors and physical activity contribute to the incidence of type 2 diabetes mellitus in Indonesia. *Kesmas*, *15*(3), 120–127.