

Risk Assessment for Type II Diabetes Mellitus among Rural Residents

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Abstract

Background: Type 2 Diabetes Mellitus (T2DM) remains a growing public health concern, particularly in rural areas in the Philippines, due to limited access to healthcare facilities, which may contribute to challenges in early detection and prevention of the disease. Risk assessment and prevention strategies are important for identifying individuals who may be at risk and supporting early intervention.

Objective: This study aimed to assess the risk of developing Type 2 Diabetes Mellitus among residents of selected rural barangays.

Methods: A quantitative-descriptive research design was employed. A total of 370 respondents participated in the study through purposive sampling. Data were collected using a questionnaire composed of the respondents' demographic profile and the Finnish Diabetes Risk Score (FINDRISC) tool. Data were analyzed using frequency distribution, descriptive statistics, and the chi-square test.

Results: Nearly half of the respondents (45.95%) were classified as having low risk of developing T2DM, while 54.05% had slightly elevated to high risk. Specifically, 38.38% were classified as having slightly elevated risk, 11.35% as moderate risk, and 4.32% as high risk. A Chi-square test of independence revealed a statistically significant association between Educational Attainment and T2DM risk level ($\chi^2=19.17$, $p=0.024$), with lower educational attainment associated with higher overall risk.

Conclusion: The findings indicate that while a substantial proportion of respondents had low risk, more than half had slightly elevated to high risk of developing T2DM, highlighting the importance of early risk assessment and preventive health measures in rural communities. The significant relationship between educational attainment and diabetes risk further underscores the need for accessible and targeted health education programs focused on T2DM prevention in the selected barangays.

Keywords: *Type 2 diabetes mellitus, Finnish diabetes risk Score (FINDRISC), risk assessment, diabetes prevention, quantitative-descriptive, Philippines*

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INTRODUCTION

Type 2 Diabetes Mellitus (T2DM) is one of the major health issues in the Philippines, with the number of affected individuals continuing to increase. This health concern is particularly important in rural communities, where limited access to healthcare facilities, insufficient early screening, and the absence of structured intervention programs may create challenges for the early identification and prevention of T2DM. The World Health Organization reports that almost 450 million adults aged 30 years and older, or about 59% of all adults with diabetes, remain untreated, with a large proportion of these individuals living in low- and middle-income countries (World Health Organization, 2024). Consequently, many individuals may remain undiagnosed until complications develop, making T2DM not only a critical health concern but also a significant socioeconomic burden on families and communities.

Globally, the burden of diabetes continues to increase. There were an estimated 537 million adults aged 20–79 years living with diabetes, with 6.7 million deaths attributed to the disease. The number of adults with diabetes is projected to increase to 643 million by 2030 and 783 million by 2045 (Magliano et al., 2021). The risk of developing T2DM increases with age, although the disease may also affect younger individuals. Other factors, including family history and lifestyle-related factors, may further contribute to an individual's risk of developing the disease (Magliano et al., 2021). These findings highlight the importance of identifying individuals who may be at risk before the development of diabetes and its associated complications.

In the Philippines, T2DM has become an important public health concern and has been reported as the fourth leading cause of death in the country (Cudis, 2021). Current healthcare programs primarily focus on diet, exercise, and lifestyle education; however, these programs have traditionally been more accessible in urban areas (Paz-Pacheco & Jimeno, 2015). Rural communities may experience additional barriers to preventive healthcare, including limited access to primary care, limited health literacy, and financial constraints, which may hinder early detection and the effective implementation of diabetes prevention strategies (Eala et al., 2022). These circumstances emphasize the need to assess diabetes risk within rural communities rather than assuming that all residents share the same level of risk.

Although rural communities may experience barriers to healthcare and preventive services, the actual level and distribution of T2DM risk among residents may vary according to individual demographic, lifestyle, and other risk-related characteristics. Therefore, community-based risk assessment can provide a clearer understanding of the proportion of residents who are at low, slightly elevated, moderate, or high risk. Such assessment is particularly relevant in rural settings where opportunities for routine screening and early identification may be limited. Rather than focusing solely on individuals who are already at high risk, identifying those with varying levels of risk may

provide an opportunity for appropriate preventive measures and health education before the condition progresses.

Many existing studies have examined T2DM risk factors and early detection, but research specifically assessing T2DM risk among residents of rural Philippine communities remains limited. This represents an important gap because findings from urban populations may not fully reflect the circumstances and healthcare access experienced by residents of rural communities. Assessing the distribution of T2DM risk in these settings can provide localized evidence that may assist healthcare providers and local health authorities in developing preventive strategies appropriate to the needs of their communities.

With this context, the present study aimed to assess the risk of developing T2DM among residents of three selected rural areas in Mindanao. Specifically, the study assessed respondents' T2DM risk levels using the Finnish Diabetes Risk Score (FINDRISC) and examined whether risk levels differed when respondents were grouped according to location, educational attainment, monthly income, and sex. By determining the distribution of risk within these rural communities, the study seeks to provide evidence that may support accessible and targeted approaches to T2DM prevention and early risk identification.

MATERIALS AND METHODS

Research Design

The researchers employed a quantitative descriptive research design to determine the risk of Type 2 Diabetes Mellitus (T2DM) among residents in three selected rural areas of Mindanao. A quantitative research design was used to quantify and analyze characteristics within a specific population. This design enabled the researchers to measure the level of risk for T2DM based on various diabetes risk variables, such as age, height, weight, Body Mass Index (BMI), lifestyle habits, and family medical history.

The descriptive research design focused on the descriptive characteristics of the population being studied. It was used in the study to describe the demographic profiles of the respondents and their associated T2DM risk levels. This provided a context-specific understanding of T2DM risk among residents in the selected rural areas and served as a basis for identifying appropriate health prevention strategies.

Research Locale

The research was conducted in three selected rural barangays: Barangay Lumbangan in Zamboanga City, Barangay Crossing Rubber in Tupi, South Cotabato, and Barangay San Roque in Trento, Agusan del Sur.

Barangay Lumbangan, a rural area in Zamboanga City, is under District II (East Coast Area). It is about 9 kilometers away from the city proper. A major source of livelihood is farming, from which local residents benefit by being hired as laborers. Health facilities, such as hospitals, are approximately 4.3 kilometers away from the barangay. The availability and accessibility of appropriate health services are important for the early identification of conditions such as T2DM.

Barangay San Roque in Trento, Agusan del Sur, situated in the Caraga Region, is a rural community heavily reliant on agriculture, particularly rice and corn farming. Like many rural areas, Barangay San Roque faces challenges in accessing healthcare, with basic services often provided through the nearest Rural Health Unit (RHU), which is approximately a 45-minute journey away from the barangay. Although there is a Barangay

Health Station, access to healthcare services remains limited, making the community vulnerable to chronic conditions such as T2DM. In addition, there were no readily available diabetes risk assessment tools in the barangay, making early detection and intervention more difficult. These circumstances provide an opportunity for health education and early detection programs that may address T2DM risk in the community.

Barangay Crossing Rubber is generally considered a rural area in the municipality of Tupi, located in the province of South Cotabato. The municipality is mostly agricultural and devotes approximately 19% of its total land to crop production. Papaya, asparagus, pineapples, fruits, vegetables, corn, coffee, and bananas are among the main crops grown in the area. Other commercial goods include wood products and processed food. In Barangay Crossing Rubber, healthcare services are primarily provided through local health facilities, including Barangay Health Stations. These facilities provide basic healthcare services; however, their capacity to manage T2DM is limited.

Research Respondents

The research respondents were residents of the rural areas of Barangay Lumbangan in Zamboanga City, Barangay Crossing Rubber in Tupi, South Cotabato, and Barangay San Roque in Trento, Agusan del Sur. Barangay Lumbangan had a population of 4,461, Barangay Crossing Rubber had a population of 3,966, and Barangay San Roque had a population of 1,406, giving a total population of 9,833 across the three selected barangays.

The respondents were selected based on the following inclusion criteria: individuals who were 18 years old or older, permanent residents of the selected barangays, individuals without a prior diagnosis of Type 2 Diabetes Mellitus, able to understand the survey questionnaire, and willing to participate with informed consent. The exclusion criteria included individuals suffering from severe medical conditions, pregnant women, individuals with cognitive or physical impairments, individuals already diagnosed with Type 1 or Type 2 Diabetes Mellitus, and temporary residents.

With a 95% confidence level, a 5% margin of error, and a total population of 9,833 across the three rural barangays, the required sample size for the study was 370 respondents. Purposive sampling was used in this study, wherein the researchers intentionally selected participants who met the eligibility criteria for the Type 2 diabetes risk assessment. Participants were recruited based on their availability, willingness to participate, and eligibility according to the inclusion and exclusion criteria. This sampling technique enabled the researchers to obtain respondents who met the criteria required for the screening and were relevant to the objectives of the study.

Since the respondents included individuals who may have limited healthcare access and health literacy, particular attention was given to the informed consent process. The researchers properly explained the informed consent form to ensure that residents were fully informed about the goals, methods, and possible discomforts before providing consent. The informed consent clearly stated that participation was voluntary. Respondents could refuse to participate or withdraw from the study at any time without penalty or consequences. They also did not waive any legal claims, rights, or remedies as a result of their participation.

Research Instrument

The research utilized a questionnaire comprising two parts. The first part gathered the demographic profile of the respondents, wherein they provided the corresponding information. The second part consisted of the Finnish Diabetes Risk Score (FINDRISC)

questionnaire, which served as the primary research instrument for assessing the risk of Type 2 Diabetes Mellitus (T2DM) (Lindström & Tuomilehto, 2003).

FINDRISC is a well-validated risk assessment tool that consists of questions regarding the respondent's age, BMI, level of physical activity, dietary practices, and family history of diabetes. FINDRISC has been reported to be a reliable predictor of diabetes risk and is useful for assessing T2DM risk in populations at risk by quantifying the respondents' answers to the questions (Atayoglu et al., 2020; Lindström & Tuomilehto, 2003). The tool was selected because it provides a straightforward and accessible approach to assessing diabetes risk and may be applied in community and primary care settings.

For each participant, the FINDRISC questionnaire was administered in a straightforward format to allow easy understanding and quick responses. The responses were scored according to the FINDRISC scoring system, and the resulting scores were categorized into different levels of diabetes risk: low, slightly elevated, moderate, and high. The categorized results were used to identify respondents who may benefit from early preventive measures and health education.

Data Gathering Procedure

The data collection process for this study began after approval from the Research Ethics Committee. The researchers obtained permission from the Barangay Captains of each of the three selected barangays to conduct the research. Once permission was granted, the researchers identified residents who met the inclusion criteria and recruited participants through purposive sampling.

Before signing the informed consent form, the selected residents were briefed about the purpose, objectives, procedures, and rights of the study. The researchers also explained the informed consent verbally using simple terms to ensure better understanding. The residents were informed that their participation was voluntary and that they had the right to refuse participation or withdraw at any time without repercussions.

The researchers then instructed the respondents on how to answer the questionnaire, after which the respondents completed the FINDRISC Risk Assessment Tool Form. The assessment was used only to determine the respondents' risk level for developing T2DM and did not constitute a clinical diagnosis of diabetes.

Potential discomfort during the assessment included anxiety regarding the respondents' health risks. To mitigate this, the researchers provided brief counseling and allowed respondents to decline any part of the assessment that they felt uncomfortable completing. The researchers also provided support to alleviate anxiety during the data collection process. Respondents were given sufficient time to complete the questionnaires to ensure that the process was not rushed, thereby promoting accuracy and reducing stress and confusion.

Afterward, the completed assessment forms were collected by the researchers. Each participant was assigned a unique code to anonymize their responses, and access to the collected data was limited to the research team. These procedures were implemented in accordance with the Data Privacy Act of 2012.

The researchers subsequently compiled and tabulated the data from all respondents for statistical analysis. The data were carefully stored for one year, after which they were to be properly disposed of by permanently deleting digital files and shredding physical records. These procedures were implemented to ensure that personal information remained confidential and was not disclosed to unauthorized persons.

The present study focused on assessing T2DM risk among residents and did not involve the implementation of a pharmacist-led intervention. The proposed roles of pharmacists in diabetes prevention, screening, counseling, and referral were developed as part of the action plan based on the findings of the study and were not part of the data collection procedure.

Data Analysis

The data were recorded using Microsoft Excel and subsequently tabulated and analyzed with the guidance of a statistician. Descriptive statistics were employed to identify the demographic profiles of residents across the three selected rural barangays in Mindanao. Frequency distributions were used to categorize participants according to their levels of T2DM risk based on their FINDRISC scores.

A Chi-squared Test was applied to determine whether significant differences existed in T2DM risk levels when respondents were grouped according to their demographic characteristics, specifically location, educational attainment, monthly income, and sex. A p-value of less than 0.05 was considered statistically significant.

Ethics Statement

This study was submitted to the Research Ethics Committee of the University of the Immaculate Conception under the protocol code UG-FR-02-25-0055. An ethical clearance was issued after committee review of the study procedures and protocols on 06 March 2025. Furthermore, informed consents were taken prior to the conduct of the survey. All data collected and manner of collection followed the Data Privacy Act of 2012.

RESULTS

Table 1 presents the demographic characteristics of the 370 respondents, including location, gender, educational attainment, and monthly income. As shown in Table 1, the respondents were almost equally distributed across the three selected barangays: 123 (33.24%) from Barangay Crossing Rubber, 123 (33.24%) from Barangay San Roque, and 124 (33.51%) from Barangay Lumbangan. In terms of gender, the majority of respondents were female (224, 60.54%), while 146 (39.46%) were male.

Table 1
Demographic Profile of the Respondents

Demographic	Group	Frequency	Percentage
Location	Barangay Crossing Rubber	123	33.24
	Barangay San Roque	123	33.24
	Barangay Lumbangan	124	33.51
Sex	Female	224	60.54
	Male	146	39.46
Educational Attainment	Less than a high school diploma	48	12.97
	High school graduate	159	42.97
	Bachelor's Degree	150	40.54
	Master's degree	13	3.51
Monthly Income	Less than 20,000	286	77.30
	20,000-50,000	71	19.19
	>50,000	13	3.51

Regarding educational attainment, most respondents had completed at least a high school education. Specifically, 159 (42.97%) were high school graduates, followed by 150 (40.54%) who held a bachelor's degree. A smaller proportion consisted of those with less than a high school diploma (48 or 12.97%) and those with a master's degree (13 or 3.51%).

Regarding monthly income, a large majority of respondents (286, 77.30%) reported earning less than 20,000 pesos per month. Meanwhile, 71 (19.19%) earned between 20,000 and 50,000 pesos, and only 13 (3.51%) reported earning more than 50,000 pesos monthly. These findings indicate that most respondents belonged to the lower-income bracket.

Table 2 presents the distribution of respondents by risk level for developing T2DM, as assessed using the FINDRISC tool. As reflected in Table 2, 170 respondents (45.95%) were classified as having low risk. Meanwhile, 142 (38.38%) were categorized as having slightly elevated risk, 42 (11.35%) as moderate risk, and 16 (4.32%) as high risk.

Table 2
Risk Level of the Respondents According to FINDRISC

Level of Risk	Frequency	Percentage
Low	170	45.95 %
Slightly Elevated	142	38.38 %
Moderate	42	11.35 %
High	16	4.32 %

Although nearly half of the respondents fell under the low-risk category, more than half (54.05%) exhibited varying degrees of risk ranging from slightly elevated to high. This indicates that a substantial proportion of the population may be susceptible to developing T2DM over the next 10 years.

The results of the chi-square test examining differences in risk levels across demographic groups are summarized in Table 3. No significant associations in risk levels were observed among respondents grouped by location ($p = 0.740$). Across the three barangays, the distribution of respondents across risk categories was relatively similar. Barangay Crossing Rubber had 57 respondents classified as low risk, 51 as slightly elevated, 11 as moderate, and 4 as high risk. Barangay San Roque showed comparable values with 53 low risk, 49 slightly elevated, 14 moderate, and 7 high risk respondents. Barangay Lumbangan had 60 low-risk, 42 slightly elevated, 17 moderate, and 5 high-risk respondents. These findings indicate that geographic location did not significantly influence the risk level of developing T2DM among the respondents.

Table 3
Chi-Square Test of Independence Between Demographic Characteristics and T2DM Risk Level

Demographic	Group	Low	Slightly elevated	Moderate	High	X ²
Location (Barangay)	Crossing Rubber	57	51	11	4	3.53
	San Roque	53	49	14	7	
	Lumbangan	60	42	17	5	

Educational Attainment	< HS Diploma	29	18	1	0	19.17*
	HS Graduate	80	52	20	7	
	Bachelor's Degree	56	64	21	9	
	Master's Degree	5	8	0	0	
Income	Less than 20,000	136	107	29	14	6.47
	20,000-50,000	27	31	12	1	
	More than 50,000	7	4	1	1	
Sex	Male	68	58	14	6	0.82
	Female	102	84	28	10	

Note: An asterisk (*) denotes a significant p-value < 0.05. HS stands for "High School".

A statistically significant association was observed when risk levels were grouped by educational attainment ($p = 0.024$), as shown in Table 3. Respondents with lower educational attainment tended to have higher risk levels compared to those with higher education.

Among those with less than a high school diploma, the majority (29) were classified as low risk, while only one respondent was in the moderate risk category and none in the high-risk category. In contrast, among high school graduates, 80 were at low risk, but a notable number were distributed across slightly elevated (52), moderate (20), and high risk (7) categories. Similarly, respondents with a bachelor's degree showed a wider distribution, including 56 low-risk, 64 slightly elevated, 21 moderate, and 9 high-risk individuals. Those with a master's degree were primarily within the low and slightly elevated categories.

The analysis revealed no significant associations in risk levels across monthly income groups ($p = 0.371$), as shown in Table 3. Among respondents earning less than ₱20,000, the majority were classified as low (136) or slightly elevated risk (107), with fewer individuals in the moderate (29) and high (14) categories. Similar patterns were observed among those earning ₱20,000–₱50,000 and those earning above ₱50,000. This indicates that income level did not significantly affect the risk of developing T2DM in this population.

Likewise, no significant association in risk levels was found when grouped by sex ($p = 0.567$). As shown in Table 3, among male respondents, 63 were classified as low risk, 53 as slightly elevated, 12 as moderate, and 4 as high risk. Among female respondents, 107 were at low risk, 89 were slightly elevated, 30 were moderate, and 12 were high risk. The distribution across categories was comparable between males and females, indicating that sex was not a significant factor influencing diabetes risk levels in this study.

DISCUSSION

The study found that respondents were almost equally distributed across the three selected rural barangays, with slightly more from Barangay Lumbangan. This balanced distribution suggests that the collected data provide a representative view of the selected rural communities. Regarding gender, the majority of respondents were female. This may indicate a greater willingness among women to participate in health-related assessments or community-based studies. Regarding educational attainment, most respondents had completed at least a high school education, with a considerable proportion having earned a bachelor's degree. However, despite this, a significant number still belonged to the lower income bracket, with the majority earning less than ₱20,000 per month. These findings

reflect the socioeconomic conditions commonly observed in rural areas, where educational attainment does not always correspond to higher income levels.

Regarding risk levels based on the FINDRISC tool, the study found that although a large proportion of respondents (45.95%) were classified as low risk, more than half (54.05%) exhibited varying degrees of risk, ranging from slightly elevated to high. These findings highlight that a substantial portion of the population may have an elevated risk of developing T2DM in the future. The presence of individuals under slightly elevated and moderate risk categories suggests that early preventive measures are necessary to prevent progression to higher risk levels. The identification of 4.32% of respondents as high risk further emphasizes the urgency for targeted interventions, particularly in rural communities where access to healthcare services may be limited.

The relatively large proportion of respondents classified as low risk may be explained by the multifactorial nature of the FINDRISC tool. Although the respondents were predominantly from lower-income households and most had completed at least high school education, these socioeconomic characteristics do not independently determine an individual's FINDRISC score. The tool considers several risk factors, including age, BMI, physical activity, dietary practices, and family history of diabetes (Lindström & Tuomilehto, 2003). Thus, the low-risk classification observed among 45.95% of respondents may indicate that a considerable proportion of the participants had fewer or lower levels of the risk factors assessed by the tool. This finding also suggests that socioeconomic characteristics alone may not fully explain the distribution of T2DM risk in the selected communities. Rather, the combination of individual and lifestyle-related factors contributes to the overall risk classification. Nevertheless, the presence of slightly elevated, moderate, and high-risk respondents indicates that preventive measures and health education remain important for reducing the likelihood of progression to higher risk levels.

The results of the study are consistent with the concept that early detection through risk assessment tools is important for identifying individuals at risk for chronic diseases. The use of the FINDRISC tool enabled respondents to assess their own T2DM susceptibility, thereby increasing awareness and encouraging preventive behaviors. As emphasized in the Health Belief Model, an individual's perception of susceptibility influences their willingness to take preventive action. The findings suggest that respondents who became aware of their risk levels may be more likely to engage in health-seeking behaviors such as lifestyle modification and participation in screening programs (Alyafei & Easton-Carr, 2026). Furthermore, the presence of "cues to action," such as pharmacist-led interventions and community-based screenings, can further motivate individuals to adopt preventive practices.

Regarding differences in risk levels across locations, the study found no significant differences among the three barangays. This indicates that geographic location within these rural areas does not significantly influence the risk of developing T2DM. Despite differences in accessibility and local resources, the similar distribution of risk levels suggests that residents across these communities may share comparable lifestyles, dietary practices, and health behaviors. This finding implies that interventions designed to address T2DM risk may be applied uniformly across similar rural settings.

On the other hand, educational attainment was found to be statistically significantly associated with respondents' risk levels. Individuals with lower levels of education were more likely to fall into higher-risk categories than those with higher levels

of education. This finding supports previous studies suggesting that education plays a crucial role in shaping health outcomes. Individuals with higher education are more likely to have better knowledge, awareness, and understanding of disease prevention and management. As supported by Lee et al. (2024), educational attainment is significantly associated with the risk of developing T2DM, with individuals having higher education demonstrating lower odds of developing the disease (Lee et al., 2024). Similarly, another study reported that increased educational attainment is associated with reduced risk and better health outcomes in individuals with T2DM (Liao et al., 2023). Moreover, health education contributes to improved knowledge, attitudes, and practices, which are essential in preventing disease progression, as highlighted by Chawla et al. (2019). These findings emphasize the importance of implementing educational interventions as part of diabetes prevention strategies, particularly for individuals with lower levels of education.

In contrast, the study found no significant difference in risk levels across monthly income groups. Although most respondents were in the lower income bracket, income alone did not significantly affect their risk of developing T2DM. This suggests that factors other than economic status, such as lifestyle behaviors, dietary habits, and genetic predisposition, may play a more direct role in determining diabetes risk. Similarly, gender was not significantly associated with risk levels, indicating that both males and females in these communities have comparable levels of risk exposure.

The study's findings also align with the principles of the PRECEDE-PROCEED Model, which emphasizes the role of predisposing, enabling, and reinforcing factors in health behavior (Kim et al., 2022). Predisposing factors, such as educational attainment, were shown to influence respondents' risk levels and their engagement in preventive practices. Enabling factors, including access to pharmacist-led interventions and community-based screening programs, provide opportunities for individuals to participate in risk assessment and health education. Reinforcing factors, such as support from local health units and positive perceptions toward healthcare providers, further encourage sustained health-seeking behaviors.

Overall, the study's results highlight the importance of community-based risk assessment and the role of educational interventions in reducing the risk of T2DM. While geographic location, income, and gender did not significantly influence risk levels, educational attainment emerged as a key factor associated with diabetes risk. These findings underscore the need for targeted health education programs and pharmacist-led interventions to improve awareness, promote early detection, and reduce the burden of T2DM in rural communities.

CONCLUSION

This study assessed the risk of developing Type 2 Diabetes Mellitus (T2DM) among 370 adult residents from three selected rural barangays using the Finnish Diabetes Risk Score (FINDRISC). The findings revealed that while 45.95% of respondents were classified as having low risk, a greater proportion (54.05%) exhibited varying levels of risk, indicating a substantial proportion of the population may be vulnerable to developing T2DM.

The respondents were predominantly female, most having completed at least a high school education and belonging to lower-income brackets. Among the demographic variables examined, only educational attainment showed a statistically significant association with T2DM risk levels ($p = 0.024$), with lower educational attainment

associated with higher risk. In contrast, no significant differences were observed when risk levels were grouped by location, monthly income, or gender.

These findings highlight the critical role of education in influencing diabetes risk and underscore the need for targeted, community-based health education initiatives. Furthermore, the results emphasize the importance of implementing pharmacist-led interventions and structured prevention programs focused on early detection, awareness, and lifestyle modification to mitigate the risk of T2DM in rural populations.

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