

## Identification of Type 2 Diabetes Mellitus Risk Factors in Urban Communities Of Archipelago and Mining Regions: Stakeholders Perspective

Kamalia Layal<sup>1\*</sup>, Restu Amalia Azmy<sup>1</sup>, Zulkifli<sup>1</sup>, Suherman<sup>2</sup>

<sup>1</sup>Medical Program, Faculty of Medicine and Health Sciences, Universitas Bangka Belitung, Pangkalpinang, Indonesia

<sup>2</sup>Nursing Program, Faculty of Nursing, Institute Citra International, Pangkalpinang, Indonesia

\*E-mail: [kamalia.nj@gmail.com](mailto:kamalia.nj@gmail.com)

### Abstract

Bangka Belitung is an archipelagic region and the world's second-largest tin producer. Communities in coastal and mining areas face health issues related to behavior, individual characteristics, and cultural factors influencing disease patterns. One prevalent disease among urban populations in Bangka Belitung is diabetes mellitus. This study aims to explore the risk factors of diabetes mellitus in urban communities in Bangka Belitung from the stakeholders' perspective. This research employed a qualitative exploratory approach conducted in Pangkalpinang city. Data were collected through in-depth interviews with participants, including eight heads of public health centers, one head of the health department, one chairperson of the Indonesian Medical Association (IDI), nine patients, and nine family members of patients across nine public health center service areas in Pangkalpinang city. Data were analyzed using thematic analysis. The study identified three main themes: (1) Lifestyle, (2) Social, economic, and environmental factors, and (3) Cognitive psychology. These factors contribute to the high prevalence of type 2 diabetes mellitus (T2DM) in urban communities in the Bangka Belitung archipelago. Comprehensive knowledge and understanding of T2DM are essential to implement effective prevention and intervention strategies to control T2DM cases in urban communities in this archipelagic and mining region.

**Keywords:** Type 2 Diabetes Mellitus, Risk Factors, Archipelago, Urban, Mining

### 1. Introduction

In recent decades, the pattern of disease has shifted significantly toward non-communicable diseases, with diabetes mellitus being one of the most prominent. A total of 589 million adults aged 20-79 years, equivalent to 1 in 9 individuals, are living with diabetes. This number is projected to rise to 853 million by 2050. In 2024, diabetes was responsible for 3.4 million deaths, equivalent to one death every 9 seconds, and contributed to a health expenditure burden of at least USD 1 trillion over the past 17 years.<sup>1</sup> In low and middle-income countries, the prevalence of diabetes mellitus among adults has increased by 8.5%, or approximately 422 million people.<sup>2</sup> In 2024, the prevalence of diabetes in Indonesia reached 11.3% of the total adult population of 185.2 million, indicating approximately 20.4 million cases of diabetes among adults.<sup>3</sup>

Urban areas have emerged as the primary contributors to diabetes mellitus cases compared to rural regions. Data indicate that the prevalence in urban areas is 1.89% or 556,419 individuals, whereas rural areas report a prevalence of 1.01% or 460,871 individuals.<sup>4,5</sup> The growing number of diabetes cases in Indonesia is largely attributable to an increase in risk factors prevalent in urban area. These include lack of physical activity, elderly, and unhealthy dietary habits.<sup>6</sup> Furthermore, studies have identified age, sex, and body mass index (BMI) as significant risk factors among urban populations.<sup>7</sup> Socio-cultural and environmental factors, along with the level of health literacy, have also been found to be strongly associated with the incidence of diabetes mellitus in urban communities.<sup>8</sup> Recognizing and understanding of these risk factors is essential to formulate effective

preventive strategies aimed at curbing the rising incidence of diabetes in urban populations.

A prevalent cognitive bias within Indonesian society is the belief that there is no need to seek information about one's health condition as long as daily activities can still be performed. Many individuals fear that knowing about a disease will lead to psychological distress. In developing countries, this mindset often results in the neglect of early health screenings, as people perceive disease awareness as a mental burden, a phenomenon identified as cognitive bias.<sup>9-11</sup> According to the Health Belief Model, this phenomenon reflects an individual's beliefs or perceptions in responding to the illness they are experiencing. These perceptions can become perceived barriers, such as uncertainty, side effects, concerns about ineffectiveness, personal dislike, anxiety, and fear that the illness may become more severe.<sup>12</sup> This mindset illustrates how the assumption of being 'healthy enough' can serve as a starting point for the emergence of various diseases, including diabetes mellitus.

In today's fast-paced and digital era, popular culture exerts a significant influence on daily life. Practices such as socializing at cafes while consuming foods and beverages with a variety of flavors and toppings have become a favored lifestyle among adolescents. This popular culture has proliferated across nearly all urban areas, becoming a prevailing trend. However, contemporary adolescent popular culture presents a concealed risk for the development of diabetes mellitus. The novelty of this study stems from the consideration that Indonesia, an archipelago composed of numerous islands with diverse populations, social environments, and cultures, encompasses multiple factors that may contribute to the rising incidence of diabetes mellitus within urban communities

## **2. Method**

This study employed a qualitative descriptive approach to explore risk factors for type 2 diabetes mellitus among urban communities. This research was conducted in the working area of public health centers (Puskesmas) in Pangkalpinang city. Participants were recruited by healthcare personnel responsible for the Non-Communicable Disease (NCD) program at the public health centers. This study involved a total of 28 participants to accommodate the research objectives in exploring from a stakeholder perspective, consisting of one head of the Pangkalpinang city health department, chairperson of the Indonesian Doctors Association (IDI) of Pangkalpinang city, 8 heads of public health centers in Pangkalpinang city, 9 individuals with type 2 diabetes mellitus, and 9 family members of individuals with type 2 diabetes mellitus.

Data for this study were collected through in-depth interviews. Ethical approval was obtained from the Ethics Committee of Aisyiyah University Yogyakarta, which granted ethical permission with identification number 3790/KEP-UNISA/VI/2024. The interview guide explored individuals' perspectives on risk factors for type 2 diabetes mellitus in urban areas. Each interview lasted approximately thirty minutes per participant, and all interviews were digitally recorded and transcribed by the researcher. Sample transcripts were anonymized and shared with the study team to support analysis. In this study, thematic analysis was employed to analyze the in-depth interviews. One advantage of this approach is that it provides flexibility for theoretical frameworks. We followed a 6-step approach to analyze the interview transcripts: familiarizing ourselves with the data, generating initial codes, searching for themes, reviewing themes, defining and naming themes, and producing the report. In the thematic analysis process

we conducted, we identified meaningful insights from the emerging themes. The researcher interpreted how these themes reflect the participants' experiences, perspectives, or subjective meanings related to the phenomenon being studied, while also considering the social and cultural context.

### 3. Result

The study involved 28 participants who were assigned identification codes as follows: one Head of the Pangkalpinang City Health Department (coded as KD), Chairperson of the Indonesian Medical Association (IDI)

Pangkalpinang (coded as ID), eight Heads of Community Health Centers (Puskesmas) in Pangkalpinang City (coded as KP1–KP8), nine individuals diagnosed with type 2 diabetes mellitus (coded as PD1–PD9), and nine family members of individuals with type 2 diabetes mellitus (coded as KL1–KL9).

The findings of the study identified three primary themes related to the risk factors of type 2 diabetes mellitus: (1) lifestyle; (2) social, economic, and environmental factors; and (3) cognitive and psychological factors, as shown in the Table 1.

**Table 1. Identified Theme and Categories**

| Theme      | Category  |
|------------|---|
| Life style | <b>Eating and Drinking Habits:</b>  |
|            | "...Nowadays, various types of beverages are widely available and accessible everywhere. You go to Alfamart or Indomaret, and everything is there. You can just pick your drink—mango, orange, sugary ones—whatever you want..." (ID) |
|            | "...Lifestyles such as uncontrolled and excessive eating and drinking habits..." (KD)   |
|            | "...Dietary patterns high in sugar, canned drinks, fast food rich in sugar and carbohydrates, these pose significant risks." (KP1)  |
|            | "...This is due to obesity caused by uncontrolled dietary and eating patterns." (KP2)   |
|            | "...Eating and drinking habits play the most important role..." (KP3)   |
|            | "...She doesn't control her eating habits, continues to buy sweet drinks, even though those are risk factors..." (KP4)  |
|            | "...Sweet foods, sweet drinks..." (KP5)   |
|            | "...Perhaps it's the food factor..." (KP6)  |
|            | "...Yes, probably a lifestyle factor. People nowadays—especially in this hot season—tend to consume more sweet products that are being sold everywhere." (KP7)  |
|            | "...Yes, a lifestyle of frequently consuming sweet foods and beverages..." (KP8)  |
|            | "...I used to eat rice sometimes four or even five times a day—no clear pattern. I'd eat a lot at night and consume a lot of sachet drinks. I just went for it..." (PD1)  |
|            | "...I love sweet foods. I enjoy fruit ice, soybean milk. I eat less rice, but I love drinks like Jasjus, Sosro tea, sweet pastries..." (PD2)  |
|            | "...I used to have a big appetite, but now I eat only 2–3 times a day. I love pempek, kemplang, syrup, orange juice, anything packaged—tea, juice—really enjoy those..." (PD3)  |
|            | "...Sweet foods and drinks, including carbonated ones, Sir..." (PD4)  |
|            | "...My diet—I eat 2–3 times a day and often snack on crackers..." (PD6)   |
|            | "...From my diet—basically, I eat whatever is available..." (PD7)   |
|            | "...My eating habits—love sweet foods..." (PD8)   |
|            | "...I used to eat rice 2–3 times a day and in large portions. I was still young and really enjoyed sweet foods..." (PD9)  |
|            | "...Dietary patterns—drinks from sachets..." (KL1)  |
|            | "...Eating habits for sure. From sweet drinks like Jasjus, carbonated drinks like Sprite and Fanta, and large food portions..." (KL3)   |
|            | "...There are no dietary restrictions—everything is consumed..." (KL4)  |

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"...It's about food—lifestyle choices involving artificial sweeteners in food and beverages..." (KL6)

**Physical Activity:**

"...An unhealthy lifestyle, lack of physical exercise—it's all there." (ID)

"...Regarding physical activity, in Bangka, people tend to follow trends, but unfortunately, they don't maintain them. They exercise only on weekends. In fact, exercise should be done daily—even if only for 10 minutes—rather than cramming it into two hours once a week." (KD)

"...Indonesians are known for being sedentary or inactive. Even though the national program 'GerMas' includes exercise, in reality, very few people actually do it." (KP1)

"...Yes, our community lacks movement and physical activity..." (KP2)

"...Lack of exercise..." (KP3)

"...In this area, it mostly comes down to lifestyle. People here tend not to enjoy physical movement or activities..." (KP5)

"...Many people don't engage in physical activity. Ideally, people should get at least 150 minutes of exercise per week. Some ask whether daily chores like sweeping count..." (KP7)

"...I never used to exercise..." (PD9)

**Popular Culture:**

"...Nowadays, there's a trend of hanging out in cafés and coffee shops..." (ID)

"...In the past two years, cafés have grown rapidly in Pangkalpinang City, and coffee shops are never empty at night. This is compounded by the popularity of trendy drinks, which we know contain high amounts of sugar..." (KD)

"...Especially now, there are many places selling these products nearby. No offense, but some of those drinks—I've tried one, and it was extremely sweet. It's everywhere now. We don't know what the consequences will be in the next five years if people keep consuming them..." (KP3)

"...These trendy drinks—kids are consuming them in large quantities..." (KP8)

**Social, economic,  
and  
environmental  
factor**

**Knowledge:**

"...Perhaps it's an issue of understanding. Their knowledge about the disease may not be sufficient. In Pangkalpinang, you can find healthcare facilities like community health centers (puskesmas) in almost every corner. Accessing information or services is not actually difficult—it's more about the patient's willingness to visit those health facilities. It's not really a matter of formal education; it's more about their level of awareness." (ID)

"...Actually, knowledge is the key point here. And knowledge isn't always acquired in school. It really has to come from personal initiative—we need to be proactive in seeking information." (KP1)

"...The mindset that diabetes can simply be managed by taking medication, or just by not eating anything sweet—that's the problem. Their reference point is only sweetness, while they don't understand that glucose doesn't only come from sweet foods. Even though we've explained repeatedly what glucose is and where it comes from, they still don't quite grasp it. So it comes back to their level of understanding about what diabetes really is." (KP4)

"...The real issue lies in their knowledge level—their willingness to obtain information." (KP8)

"...I don't know. All I know is what the doctor said about diet. Beyond that, I have no idea..." (PD2)

"...I don't know much. People say drinking sweet beverages often causes it, but I don't know about other causes..." (PD3)

**Income:**

"...I think income clearly plays a role, just like with lifestyle. People with higher income tend to hang out at cafés more often and consume sweet foods and drinks. Lifestyle habits are definitely influenced by income—if they earn more, they're likely to visit those places more frequently." (KD)

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"...Regarding the economic aspect, of course it has an influence, because healthy food sometimes costs more." (KP1)

"...Economically, the upper-middle class shows higher rates of diabetes compared to those from lower-income groups." (KP5)

#### Religious Traditions and Health:

"...In Bangka, there are many religious events throughout the year, and these events become one of the contributing factors—since they often involve serving sweet drinks and foods." (KP5)

"...In the Bangka Belitung Islands, there are many religious gatherings, which I believe also contribute to the incidence of diabetes. People serve sweet foods and drinks in every household, and when consumed in large amounts, it can have a significant impact." (KD)

#### Cognitive psychology

#### Cognitive Bias / Mindset:

"...Some people refuse to get checked, because they're afraid that if the results are high, they'll start overthinking it." (KP7)

"...I go to the doctor maybe once a month, or sometimes not at all. If I get checked and see the results, it stresses me out. So I just go on as long as I feel okay..." (PD1)

"...Pardon me, I know what causes diabetes or high blood sugar, but regular exercise doesn't guarantee prevention either. My friend was a top cyclist, always in first place, and he still passed away. He maintained his diet and drinks, but still ended up with diabetes." (PD4)

## 4. Discussion

This study identified three main themes. Theme 1, lifestyle, consists of three categories: eating and drinking habits, physical activity, and popular culture. Theme 2 Social, economic, and environmental includes three categories: knowledge, income, and religious traditions. Theme 3 consists of one category: cognitive bias/mindset. These factors serve as risk factors for the occurrence of type 2 diabetes mellitus as illustrated in Figure 1.

Diabetes mellitus remains a global public health challenge, particularly in developing countries where its rising prevalence has not been effectively curbed. The researcher analyzed the findings obtained from the study. If this condition continues to be left unaddressed and is not promptly managed, it will result in significant economic losses for developing countries, particularly in Indonesia. Diabetes mellitus is a serious degenerative disease that requires prevention. Identifying risk factors is an effort to prevent the incidence of type 2 diabetes mellitus. An individual's lifestyle, particularly irregular eating and drinking patterns such as

the frequent consumption of sugary foods and beverages, can be a contributing risk factor for type 2 diabetes mellitus. Excessive sugar intake contributes to weight gain and obesity, both of which are strongly associated with insulin resistance and elevated blood glucose levels.<sup>13,14</sup>

Lack of physical activity, often referred to as a sedentary lifestyle, has become a prevalent issue in society. This phenomenon is a contributing risk factor for the development of diabetes mellitus. Inadequate physical activity leads to unused energy, while energy intake from food continues to rise. This imbalance between energy intake and expenditure results in an energy surplus. A sedentary lifestyle is strongly associated with the pathogenesis of impaired glucose tolerance and is a key risk factor for diabetes (insulin resistance).<sup>15,16</sup>

In the digital era, popular culture greatly influences adolescent life, from food trends to lifestyles shaped by social media. These emerging habits often carry unintended health consequences. Among adolescents, popular culture continues to evolve alongside social changes and technological

advancements. One striking trend in recent years is the rise of social gatherings at cafés that serve sweet beverages and coffee. This “hanging out” culture has become a hallmark of modern youth lifestyle. However, behind this enjoyment lies a hidden danger, the increasing risk of developing type 2 diabetes mellitus.

A lack of understanding and knowledge about risk factors, prevention, and symptoms is also a significant contributor to the incidence of diabetes mellitus.<sup>17,18</sup> High income is considered a risk factor for diabetes mellitus in urban areas. We found an inverse relationship between income and diabetes prevalence; the higher the income, the lower the incidence of diabetes, and vice versa.<sup>19,20</sup> However, the researchers' analysis suggests that this relationship is influenced by the level of consumer behavior among urban populations. In essence, higher income reflects higher socioeconomic status, which significantly influences individual lifestyle choices.

Sociocultural traditions deeply influence dietary patterns across Indonesia. In Bangka Belitung, for instance, religious celebrations commonly involve communal feasts rich in carbohydrates and sugary dishes. A similar phenomenon is observed among the Bugis-Makassar ethnic group during the Tolotang celebration in South Sulawesi. Foods typically served during these events, such as sticky rice, chicken curry, and traditional sweets, are calorie-dense and contribute to increased diabetes risk when consumed regularly.<sup>21</sup>

Cognitive psychology also plays a role. Cognitive psychology within the majority of Indonesian populations reveals a prevalent cognitive bias characterized by the perception that it is unnecessary to be aware of one's illness as long as daily activities remain unaffected. The awareness of a disease is often perceived as a source of psychological burden. In developing countries, there is a

tendency among the population to disregard early health screenings due to the belief that knowledge of a disease condition exacerbates mental stress, a phenomenon identified as cognitive bias.<sup>9-11</sup> This condition illustrates how the cognitive bias of "as long as I am feeling well, there is no need for me to know" can contribute to the early onset of diabetes mellitus.

## **5. Conclusion**

Lifestyle factors including dietary patterns, physical activity, and prevailing popular culture; socio-economic and environmental determinants such as income, knowledge, and traditional safety practices; as well as cognitive psychological factors manifested through cognitive biases, constitute significant risk factors for the incidence of type 2 diabetes mellitus within urban communities in island and mining regions. A comprehensive and profound understanding of type 2 diabetes mellitus is essential to support the design and implementation of effective prevention programs and interventions aimed at controlling its incidence.

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