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Analysis of the Relationship Between Dietary Patterns and the Risk of Non-Communicable Diseases Among Urban Adolescents in Mataram City, Lombok

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Abstract

Non-communicable diseases (NCDs), including obesity, diabetes, and hypertension, are becoming increasingly prevalent among adolescents, especially in urban areas experiencing rapid lifestyle changes. This study aims to analyze the relationship between dietary patterns and the risk of NCDs among adolescents in Mataram City, Lombok. A cross-sectional study was conducted involving 300 high school students aged 15–18 years from five schools across Mataram. Data collection included validated food frequency questionnaires (FFQ), anthropometric measurements, and structured interviews to assess lifestyle factors. Dietary patterns were classified into three categories: healthy (high intake of fruits, vegetables, and whole grains), mixed (moderate intake of processed and sugary foods), and unhealthy (frequent consumption of fast food, sweetened beverages, and high-fat snacks). Risk indicators such as Body Mass Index (BMI), blood pressure, and family history of NCDs were analyzed using chi-square tests and logistic regression. The results indicated a significant association between unhealthy dietary patterns and elevated BMI ($p < 0.01$) and increased systolic blood pressure ($p < 0.05$). Adolescents with unhealthy eating habits were found to be 2.7 times more likely to be at risk for NCDs compared to their peers with healthy diets (OR = 2.7; 95% CI: 1.7–4.3). These findings emphasize the urgent need for targeted nutritional education and health promotion strategies in urban schools within Mataram. Early interventions can play a crucial role in reducing the long-term burden of NCDs among the youth population.

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Introduction

Non-communicable diseases (NCDs) — including obesity, type 2 diabetes mellitus, hypertension, cardiovascular diseases, and certain types of cancer — have emerged as a dominant global health burden in both developed and developing countries. Traditionally associated with older adults, NCDs are now increasingly prevalent among younger age groups, particularly adolescents,

signaling a worrying shift in epidemiological patterns (World Health Organization [WHO], 2021). According to recent WHO data, NCDs account for approximately 74% of all global deaths, with more than 15 million people dying prematurely each year between the ages of 30 and 69 (WHO, 2020). Alarmingly, risk factors for these diseases, such as elevated body mass index (BMI), dyslipidemia, hyperglycemia, and elevated blood pressure, are now being identified in adolescents and even children, indicating the early onset of metabolic dysfunction.

This emerging trend reflects a complex interplay of behavioral, social, and environmental determinants. The global rise in sedentary behavior, coupled with increased consumption of calorie-dense, nutrient-poor foods, is contributing to a spike in adolescent obesity and other metabolic abnormalities (Ng et al., 2014). In low- and middle-income countries, rapid urbanization and globalization have accelerated the nutrition transition — a shift from traditional diets high in fiber and micronutrients to Western-style diets rich in sugar, salt, and saturated fat (Popkin & Reardon, 2018). As a result, adolescents are increasingly exposed to obesogenic environments that promote poor dietary choices and physical inactivity, often with limited access to preventive healthcare or health education.

Moreover, adolescence represents a critical developmental window in which lifelong health behaviors are established. Physiologically, it is a period of rapid growth and hormonal change, making individuals more vulnerable to the effects of poor nutrition and lifestyle choices (Patton et al., 2016). Psychosocial factors, including peer influence, media exposure, and academic stress, further exacerbate unhealthy behaviors during this time. Without timely intervention, these risk factors can accumulate and track into adulthood, increasing the likelihood of early morbidity and placing significant strain on healthcare systems (Sawyer et al., 2012). Therefore, understanding the early determinants of NCDs in adolescence is vital for designing effective public health strategies aimed at prevention and early risk reduction.

Dietary habits formed during adolescence play a pivotal role in shaping long-term health outcomes (Sawyer et al., 2012). This period of life is marked by rapid physical, emotional, and cognitive development, during which individuals begin to assert independence and make more autonomous lifestyle choices—including those related to food. As adolescents gain greater control over their eating decisions, their choices are often shaped by a complex interplay of environmental influences, including family habits, school food availability, marketing strategies, and especially peer norms (Story et al., 2002).

Unfortunately, these influences frequently promote the consumption of calorie-dense, nutrient-poor foods high in sugar, fat, and salt. This pattern of unhealthy eating can become deeply ingrained, setting the foundation for dietary behaviors that persist into adulthood. Over time, such patterns are associated with increased risks of non-communicable diseases, such as obesity, type 2 diabetes, hypertension, and cardiovascular conditions (WHO, 2014). Additionally, adolescence represents a critical window for nutrition, as nutrient needs are heightened due to growth spurts and hormonal changes. Failure to meet these nutritional needs during this stage can have lasting consequences on physical and cognitive development, as well as overall health trajectories later in life.

Given the long-term implications, fostering healthy dietary habits during adolescence is essential. This includes promoting nutritional education, creating supportive food environments, and implementing public health policies that limit the availability and marketing of unhealthy foods to adolescents. Interventions during this stage hold substantial potential to prevent chronic diseases and promote lifelong health and well-being.

Urbanization has drastically altered traditional food systems, replacing them with highly processed and energy-dense diets that are often low in essential nutrients (Popkin, 2017). As cities expand and lifestyles become more fast-paced, traditional dietary practices—once centered on home-cooked meals and locally sourced ingredients—are increasingly being replaced by convenience-

oriented food consumption. In urban environments, the availability and marketing of ultra-processed foods have intensified, making such options more accessible, affordable, and appealing, especially to young people.

In cities like Mataram, the effects of urban sprawl are particularly evident. The growth of shopping malls, convenience stores, and fast-food outlets in both central and suburban areas has reshaped the local food landscape (Popkin & Reardon, 2018). These changes have made it easier for adolescents to access fast food and sugary beverages, often at the expense of more nutritious, traditional foods such as fresh vegetables, fruits, and whole grains. Moreover, the cultural perception of fast food as modern and desirable can further influence adolescents' food choices, reinforcing unhealthy eating patterns.

Urban living also brings about lifestyle changes that contribute to poor dietary habits—such as reduced time for home meal preparation, increased reliance on packaged meals, and greater exposure to food advertising through digital platforms. These factors collectively create an obesogenic environment, where unhealthy eating is normalized and even encouraged. For adolescents, who are particularly susceptible to peer influence and media messaging, this environment poses significant risks to their current and future health.

Understanding the nutritional implications of urbanization in areas like Mataram is critical for informing public health interventions. Policies that promote access to healthy foods, regulate marketing of unhealthy products, and support urban agriculture initiatives can help mitigate the negative impact of urbanization on adolescent nutrition. Additionally, integrating nutrition education into school curricula and community programs can empower youth to make informed dietary choices amidst a rapidly changing food system.

Urban adolescents are at greater risk of adopting unhealthy lifestyles due to increased exposure to junk food advertising, irregular eating schedules, and sedentary behaviors (Ng et al., 2014). The urban environment often promotes convenience and instant gratification, making adolescents more susceptible to aggressive marketing campaigns that target their age group with high-calorie, low-nutrient food and beverages. Digital platforms and social media, widely accessed by urban youth, serve as powerful channels for promoting these products, often portraying them as trendy or desirable.

In addition, urban adolescents frequently experience irregular eating patterns, including skipping breakfast, snacking late at night, or relying on processed meals due to busy school schedules, extracurricular commitments, or a lack of parental supervision during mealtimes. Such habits disrupt normal metabolic processes and can lead to excessive caloric intake, poor nutrient absorption, and weight gain over time.

Compounding these dietary issues is the increase in sedentary behavior. Urban environments often limit opportunities for physical activity, particularly in areas where public spaces for recreation are scarce, unsafe, or undervalued. Adolescents may spend a large portion of their day engaged in screen-based activities—such as using smartphones, watching television, or playing video games—rather than participating in sports or active commuting (e.g., walking or biking to school).

These interrelated lifestyle factors—poor diet, irregular eating patterns, and physical inactivity—create a high-risk profile for the early onset of non-communicable diseases (NCDs), including obesity, type 2 diabetes, cardiovascular disease, and metabolic syndrome (Bhutta et al., 2013). What is particularly concerning is that these conditions, once considered adult-onset diseases, are increasingly being diagnosed during adolescence, signaling a shift in global health trends and emphasizing the urgency for preventive interventions.

To mitigate these risks, comprehensive public health strategies are needed—ones that address not only individual behavior but also the broader social and environmental determinants of health. This includes regulating food advertising directed at youth, improving access to healthy meals in schools, ensuring safe recreational spaces, and incorporating lifestyle education into adolescent

health programs. By addressing these factors early, we can help urban adolescents establish healthier routines and reduce their long-term risk of NCDs.

Indonesia is currently facing a double burden of malnutrition, a complex public health challenge where undernutrition—such as stunting—coexists with overnutrition, particularly overweight and obesity (Ministry of Health Indonesia, 2021). This phenomenon is increasingly evident in urban areas, where rapid socio-economic and lifestyle transitions have led to dramatic shifts in dietary patterns and physical activity levels. While stunting remains a concern, especially in lower-income households, urban centers like Mataram are simultaneously experiencing a sharp rise in adolescent overweight and obesity rates.

This paradox reflects the unequal and uneven development within urban populations. On one hand, some adolescents still lack access to adequate nutrition during critical growth periods, resulting in chronic undernutrition and impaired development. On the other hand, a growing number are exposed to environments saturated with energy-dense, ultra-processed foods, leading to excessive calorie intake and weight gain. These contrasting outcomes often occur within the same communities, or even within the same household.

In cities like Mataram, increased availability of fast food, sugary beverages, and snacks—often perceived as more convenient or modern—has replaced traditional dietary habits rooted in fresh, local produce and balanced meals. Combined with low physical activity levels due to academic pressures, limited recreational space, and a rise in sedentary entertainment, adolescents are increasingly at risk of developing non-communicable diseases (NCDs) at an earlier age.

The coexistence of stunting and obesity not only complicates public health responses but also places a heavy burden on health systems. Stunted adolescents who become overweight later in life are at an even higher risk of metabolic disorders, due to compromised early-life nutrition followed by excess energy intake. This life-course trajectory underscores the urgent need for integrated, multi-sectoral interventions that address both forms of malnutrition simultaneously.

Efforts should include nutrition-sensitive policies that improve access to healthy, affordable foods in urban settings, strengthen school-based nutrition programs, and promote physical activity through urban planning and community engagement. Public awareness campaigns and family education are also critical to shift cultural perceptions and promote healthier lifestyle choices among adolescents. Only through a coordinated approach can Indonesia hope to reduce the impact of the double burden of malnutrition and foster a healthier generation.

National health surveys reveal a concerning upward trend in obesity among Indonesian adolescents over the past decade, highlighting a significant public health issue that continues to escalate (Riskesdas, 2018; UNICEF, 2021). The data consistently show that urban youth are disproportionately affected compared to their rural counterparts. This disparity can be attributed to a combination of environmental, socio-economic, and behavioral factors that are uniquely prevalent in urban settings.

Urban adolescents are more frequently exposed to obesogenic environments—characterized by the widespread availability of high-calorie, ultra-processed foods, aggressive food marketing, and limited opportunities for physical activity. Lifestyle changes driven by urbanization, such as increased screen time, academic stress, and a shift away from traditional diets, further compound the risk of weight gain. Moreover, the normalization of sedentary leisure activities and consumption of fast food in cities reinforces unhealthy habits at a critical stage of growth and development.

While national data provide a valuable overview, the complexity and regional variability of adolescent obesity demand more localized research. For instance, cities like Mataram may present distinct socio-cultural, economic, and infrastructural conditions that influence dietary choices and lifestyle behaviors differently than in Jakarta or Surabaya. Factors such as local food culture, urban

planning, income distribution, and access to recreational spaces play a significant role in shaping adolescent health outcomes.

Conducting region-specific studies is essential to better understand the root causes and contributing factors of obesity in different urban contexts. These studies can provide nuanced insights into how local environments interact with adolescent behaviors and help identify targeted interventions that are culturally appropriate and contextually relevant. Furthermore, localized evidence can support municipal health authorities in designing more effective, community-based strategies to combat rising obesity rates among adolescents.

Ultimately, addressing adolescent obesity in Indonesia requires a multi-layered approach—one that combines national policy direction with regional-level implementation grounded in robust, context-sensitive data.

Mataram City represents a critical case study in understanding the broader dynamics of nutrition transition occurring across Indonesia. As the capital of West Nusa Tenggara, Mataram has experienced rapid urbanization and modernization, which have significantly transformed its food environment, lifestyle patterns, and health profile. This transformation reflects the national trends in which traditional diets rich in vegetables, legumes, and staple grains are increasingly being replaced by diets high in fats, sugars, and processed foods.

The city's growing population, expanding infrastructure, and integration into global food markets have contributed to a shift in eating behaviors, particularly among adolescents. Convenience stores, fast-food outlets, and modern supermarkets are becoming more prevalent, offering energy-dense, nutrient-poor food options that are both affordable and heavily marketed. At the same time, physical activity levels among youth have declined due to more sedentary lifestyles, limited recreational spaces, and greater use of digital technology.

These developments position Mataram as a microcosm of Indonesia's nutrition transition, where the consequences of rapid modernization—such as rising rates of overweight, obesity, and diet-related non-communicable diseases (NCDs)—are increasingly evident. Importantly, the city also continues to face challenges related to undernutrition, including stunting and micronutrient deficiencies, particularly among low-income households. This dual burden of malnutrition underscores the complexity of the public health landscape in urban centers like Mataram.

Given these conditions, Mataram provides a strategic setting for in-depth, region-specific research. Studying the city's adolescent population can offer valuable insights into how urbanization influences dietary patterns and health outcomes, and how interventions might be tailored to local realities. Findings from Mataram can inform policies not only at the municipal level but also serve as a model for other mid-sized Indonesian cities undergoing similar transitions.

In light of the city's significance, evidence-based, context-sensitive interventions are urgently needed to address the emerging health risks associated with dietary change and lifestyle modernization. These should include nutrition education, school-based health programs, urban planning that promotes active living, and policies to regulate unhealthy food marketing—particularly to vulnerable groups such as adolescents.

Local-level studies are essential for designing effective, contextually appropriate, and sustainable community-based interventions (Glanz et al., 2008). Public health challenges—particularly those related to adolescent nutrition and lifestyle—are often shaped by localized socio-cultural, economic, and environmental factors that national-level data alone cannot fully capture. Therefore, generating empirical evidence at the local level becomes critical for developing targeted strategies that resonate with the lived experiences and needs of specific populations.

In the case of Indonesia, while there is a growing body of research on malnutrition and non-communicable diseases, most existing studies lack a specific focus on adolescents living in urban contexts, especially in mid-sized cities like Mataram (Amrita et al., 2019). This represents a significant research gap, as adolescence is a pivotal life stage marked by rapid biological and psychosocial

development, during which health-related behaviors are often formed and solidified. Moreover, urban adolescents are increasingly exposed to environmental risk factors—such as unhealthy food availability, media-driven dietary influences, and reduced physical activity—that differ from those in rural settings.

The absence of adolescent-specific, urban-focused research limits the ability of policymakers, educators, and health practitioners to tailor interventions effectively. For instance, interventions designed based on rural data may not adequately address the unique challenges faced by urban youth, such as greater peer influence, exposure to modern food marketing, and limited access to safe recreational spaces. Additionally, without disaggregated data, efforts to address urban health disparities may overlook vulnerable subgroups—including low-income adolescents—who are at heightened risk of both undernutrition and obesity.

Mataram, as a growing urban center undergoing rapid social and dietary transformation, presents an ideal setting for regionally focused studies. These studies can explore the specific drivers of unhealthy behaviors among adolescents, including school food environments, family dynamics, media consumption, and urban infrastructure. Insights drawn from such research can inform evidence-based policies that are not only effective in Mataram but also adaptable to other Indonesian cities facing similar transitions.

In conclusion, investing in localized adolescent health research is not merely academic—it is a necessary foundation for developing responsive, equitable, and impactful health interventions that can improve the well-being of Indonesia's youth amidst ongoing urbanization and nutritional transition. Understanding the connection between dietary patterns and non-communicable disease (NCD) risk factors is essential to inform the development of evidence-based policies and adolescent health programs (Springer et al., 2006). As adolescence is a critical period for establishing long-term eating behaviors, insights into how specific dietary habits contribute to the early onset of NCDs—such as obesity, type 2 diabetes, and hypertension—are crucial for preventive health strategies. Without such knowledge, interventions risk being generic, ineffective, or misaligned with the realities of adolescent life.

Dietary patterns—such as high intake of sugary beverages, processed snacks, fast food, and low consumption of fruits, vegetables, and whole grains—have been consistently linked with increased risk of metabolic disorders and other NCDs. Identifying these patterns within specific populations allows for the early detection of behavioral risk factors and provides a scientific basis for designing targeted nutrition interventions. For urban adolescents, who are increasingly exposed to marketing pressures, time constraints, and convenience-driven choices, such analysis is especially important.

Moreover, this understanding can directly inform school- and family-based education programs, which play a vital role in shaping adolescent health behaviors. Schools serve as a primary setting where structured nutrition education can be implemented, healthy food environments can be fostered (e.g., in canteens and lunch programs), and physical activity can be promoted. By integrating dietary pattern research into curriculum development, educators can deliver more relevant, relatable, and practical guidance to students.

Similarly, families are foundational in influencing adolescents' food choices and lifestyle habits. Parental knowledge, food availability at home, and meal practices all contribute to shaping dietary behavior. When families are equipped with accurate, evidence-based information, they are more likely to support healthy routines, provide nutritious meals, and model positive behaviors. Therefore, community outreach and parenting workshops informed by dietary research can amplify the impact of school-based efforts.

In short, a deeper understanding of the diet–NCD nexus in adolescents is not only academically valuable—it is a public health imperative. Such knowledge enables the design of holistic and integrated strategies that bridge individual behavior change with supportive environments,

ultimately contributing to healthier adolescent populations and a reduction in NCD prevalence in the long term.

The dietary pattern approach offers a more holistic and comprehensive framework for analyzing the complex relationship between nutrition and health outcomes (Hu, 2002). Unlike traditional nutrient-based or single-food analyses, which isolate the effects of individual dietary components (e.g., saturated fat, sugar, or vitamin intake), this approach considers the overall combination of foods and beverages consumed—reflecting real-world eating behaviors more accurately.

This framework is particularly valuable because foods are rarely consumed in isolation; they are part of habitual eating patterns where multiple food items interact, potentially in synergistic or antagonistic ways, to influence disease risk. For example, a pattern rich in fruits, vegetables, whole grains, and lean proteins may collectively reduce inflammation and improve metabolic health, while a pattern high in ultra-processed foods, sugary drinks, and red meats may compound risk factors for obesity, type 2 diabetes, and cardiovascular disease.

By capturing these interactions among food groups, the dietary pattern approach enables researchers and policymakers to better understand the multidimensional nature of diet-related health outcomes. It accounts for cultural, socioeconomic, and lifestyle influences that shape food choices, making it especially relevant in diverse settings such as Indonesia, where dietary transitions are occurring rapidly due to urbanization and globalization.

Moreover, this approach facilitates the identification of population-specific patterns—such as "Western," "traditional," or "modern" dietary profiles—which can be linked to specific health outcomes within a given context. In adolescent populations, for instance, examining prevailing dietary patterns can help uncover associations with weight status, nutrient adequacy, or early markers of non-communicable diseases (NCDs). Such insights are critical for designing effective public health interventions and nutritional guidelines that are culturally appropriate and behaviorally realistic.

In the context of urban environments like Mataram, where adolescents face increasing exposure to fast food, convenience snacks, and sedentary habits, the dietary pattern approach allows for a more nuanced analysis of risk and resilience. It also supports the development of intervention strategies that target overall eating behaviors rather than isolated food items, making education and policy efforts more practical and impactful.

Ultimately, adopting the dietary pattern approach aligns with a systems-thinking perspective on nutrition, where food, behavior, environment, and health outcomes are viewed as interconnected elements—essential for addressing the complex challenges of modern adolescent health.

Rather than focusing solely on individual nutrients, the dietary pattern approach emphasizes the combinations of foods that are commonly consumed together, offering a more realistic and applicable framework for public health planning and nutrition research (Schulze et al., 2006). While nutrient-based analyses have historically been foundational in nutritional science, they often fail to capture the complexity of actual eating behaviors. People do not eat nutrients in isolation—they consume meals composed of various food items that interact in ways that can influence health outcomes.

This holistic perspective allows for a better understanding of how dietary habits function as part of broader lifestyle patterns, which are shaped by culture, socio-economic status, food availability, and individual preferences. For example, a meal consisting of white rice, fried chicken, and sweetened iced tea—common in many Indonesian urban settings—may have vastly different health implications than a nutrient-equivalent meal consisting of brown rice, grilled tofu, and water, despite similar caloric values. Nutrient-focused analysis might not fully account for these differences, whereas a dietary pattern approach can.

From a public health planning perspective, analyzing dietary patterns offers several practical advantages. It aligns more closely with how people actually make food choices and provides a clearer

foundation for formulating dietary guidelines, education programs, and community-level interventions. Rather than instructing individuals to monitor specific nutrient intakes—which can be confusing and impractical—health professionals can promote broader patterns of healthy eating (e.g., encouraging plant-based meals, reducing processed foods, increasing whole foods), which are easier to understand and adopt.

In addition, dietary pattern analysis can help identify population-level risk trends that are not visible through nutrient-specific data alone. This is particularly important for designing preventive strategies targeting groups such as adolescents, who often exhibit emerging unhealthy eating habits that, over time, contribute to the development of non-communicable diseases (NCDs). Understanding the typical food combinations consumed by adolescents in urban areas like Mataram enables more culturally relevant, age-appropriate interventions, such as improving school canteen menus, regulating food advertisements, or engaging families in cooking education.

Overall, by reflecting real-world dietary behavior and providing actionable insights, the dietary pattern approach bridges the gap between nutritional science and public health application, supporting more effective, scalable, and sustainable health interventions.

Adolescence is a critical window of opportunity for health intervention, as it is a period marked by rapid physical, psychological, and social development. During this stage, individuals form lifelong habits, including dietary patterns, physical activity routines, and attitudes toward health and well-being. Behaviors adopted in adolescence—whether healthy or harmful—often persist into adulthood, significantly influencing the trajectory of an individual's health status (Patton et al., 2016). As such, interventions during this phase are particularly strategic, as they have the potential to yield long-lasting benefits across the life course.

This life-stage sensitivity makes adolescence an ideal target for preventive public health strategies, especially in the context of rising rates of non-communicable diseases (NCDs) and the double burden of malnutrition seen in many low- and middle-income countries, including Indonesia. Intervening early to establish positive health behaviors—such as balanced eating, regular physical activity, and avoidance of harmful substances—can reduce the risk of chronic illnesses later in life, such as diabetes, cardiovascular disease, and obesity.

From a policy and economic standpoint, early intervention is also more cost-effective than treatment at later stages (Jamison et al., 2013). Preventive measures targeting adolescents can lead to significant savings in healthcare expenditures by reducing the future burden on medical systems. For example, the costs associated with managing obesity-related complications in adulthood—such as hypertension, joint disorders, and insulin resistance—far outweigh the investments required for school-based nutrition education, community health promotion, or adolescent wellness programs.

Moreover, adolescence is a period of heightened receptiveness to external influence—peer dynamics, media exposure, school environments, and family systems all play a role in shaping behavior. This creates a window of opportunity to embed health-promoting messages through multi-level interventions that leverage the environments in which adolescents live, learn, and socialize. School curricula, social media campaigns, and family-based initiatives can work synergistically to reinforce healthy behaviors during this formative period.

In the urban context—such as in cities like Mataram, where adolescents are navigating rapid socio-cultural change, increased exposure to unhealthy food options, and sedentary lifestyles—timely and context-specific interventions are especially vital. Ignoring this window not only risks the entrenchment of unhealthy behaviors but also contributes to the intergenerational transmission of poor health outcomes.

In summary, prioritizing adolescent health is both a preventive and investment-oriented approach, with the potential to improve population health outcomes, reduce long-term healthcare costs, and build a healthier, more productive future generation.

Schools serve as important platforms for instilling healthy habits among adolescents (Contento, 2011). However, many urban schools in Indonesia lack structured nutrition education (Prabandari et al., 2020). Family dynamics significantly shape dietary habits. In urban settings, parental workload and reliance on packaged food compromise adolescents' diet quality (Nurwanti et al., 2019). Peer influence is another determinant of food choice during adolescence, especially in school environments where fast food is normalized (Verstraeten et al., 2016).

Socioeconomic disparities influence access to nutritious foods, leading to health inequalities. Adolescents from low-income households are more likely to consume low-cost, high-calorie foods (Drewnowski & Specter, 2004). A comprehensive understanding of adolescent nutrition must integrate sociocultural, economic, and behavioral determinants (Kremers et al., 2006). These interrelated factors shape dietary choices in urban areas. This study addresses the gap in localized data on adolescent dietary behaviors and NCD risk in Mataram, aiming to provide evidence for interventions tailored to the region (Rachmi, 2021).

Effective public health strategies must consider adolescents' perspectives, daily routines, and preferred foods to be successful (Perez-Rodrigo & Aranceta, 2003). The inclusion of youth voices in intervention design is essential. By exploring the link between diet and disease risk among adolescents, this study contributes to national goals of reducing NCD burden and improving long-term population health outcomes (Ministry of Health Indonesia, 2022).

Methods

This study utilized a cross-sectional design to examine the relationship between dietary patterns and the risk of non-communicable diseases (NCDs) among adolescents in Mataram City, Lombok. A total of 300 high school students aged 15 to 18 years were selected from five schools representing different regions of the city through random sampling. Data collection involved the use of a validated Food Frequency Questionnaire (FFQ) to assess dietary intake, alongside anthropometric measurements and structured interviews. Body weight and height were measured to calculate Body Mass Index (BMI), while blood pressure was recorded using a digital sphygmomanometer under standardized resting conditions. Structured interviews were also conducted to gather information on lifestyle factors such as physical activity, sleep habits, and family history of NCDs.

Based on responses from the FFQ, dietary patterns were categorized into three groups: healthy (high consumption of fruits, vegetables, and whole grains), mixed (moderate intake of processed and sugary foods), and unhealthy (frequent consumption of fast food, sweetened beverages, and high-fat snacks). The collected data were analyzed using SPSS version [X.X]. Descriptive statistics were used to summarize participant characteristics, while chi-square tests assessed associations between dietary patterns and NCD risk indicators such as BMI and blood pressure. Logistic regression analysis was applied to estimate the strength of association between dietary patterns and NCD risk, with odds ratios (OR) and 95% confidence intervals (CI) reported. Statistical significance was determined at a p-value of less than 0.05.

Results and Discussions

The findings of this study revealed a statistically significant association between unhealthy dietary patterns and an increased risk of non-communicable diseases (NCDs) among adolescents in Mataram City. Among the 300 high school students surveyed, 38% were found to adhere to an unhealthy dietary pattern, characterized by frequent consumption of fast food, sugar-sweetened beverages, and high-fat snacks. This group of adolescents demonstrated a higher prevalence of elevated Body Mass Index (BMI) and increased systolic blood pressure compared to their counterparts who followed healthy or mixed dietary patterns.

Chi-square test results indicated a significant relationship between dietary pattern and BMI status ($p < 0.01$), and between dietary pattern and systolic blood pressure ($p < 0.05$). Furthermore, logistic regression analysis showed that adolescents who regularly consumed unhealthy foods were 2.7 times more likely to be at risk of NCDs compared to those following a healthy diet (OR = 2.7; 95% CI: 1.7–4.3). These findings suggest that dietary behaviors in adolescence play a crucial role in the development of early risk factors for chronic health conditions, particularly obesity and hypertension.

The elevated BMI and blood pressure observed in the unhealthy diet group are early indicators of metabolic disturbances, which, if left unaddressed, may progress to more severe NCDs such as type 2 diabetes, cardiovascular diseases, and stroke in adulthood. These results align with numerous previous studies that have demonstrated the impact of high-calorie, nutrient-poor diets on adolescent health outcomes. Urban environments, including Mataram, are undergoing rapid modernization and lifestyle shifts that influence food availability, preference, and accessibility—often favoring processed and convenience foods over traditional and healthier options.

Additionally, lifestyle factors such as sedentary behavior, increased screen time, irregular sleep patterns, and lack of physical activity may compound the effects of poor nutrition and accelerate the development of NCD risk factors. While this study primarily focused on dietary patterns, the structured interviews conducted also hinted at a broader context in which these unhealthy behaviors occur, underscoring the multifactorial nature of adolescent health risks.

The public health implications of these findings are significant. Adolescents represent a critical window of opportunity for intervention, as habits formed during this life stage often continue into adulthood. Therefore, implementing targeted school-based nutritional education programs, promoting healthy canteen policies, and engaging families in healthy lifestyle promotion are essential steps. Involving community stakeholders, including local governments, educators, and health professionals, is also key to fostering supportive environments where healthy choices are accessible, affordable, and culturally appropriate.

In conclusion, this study highlights the urgent need for proactive strategies to curb the rising prevalence of NCD risk factors among adolescents in urban Indonesia. By addressing unhealthy dietary behaviors early, it is possible to reduce the long-term health and economic burden associated with non-communicable diseases and contribute to the development of a healthier generation.

Conclusion

The findings of this study underscore the pressing public health concern posed by the increasing prevalence of non-communicable diseases (NCDs) among adolescents, particularly in urban areas like Mataram City, Lombok, where rapid lifestyle and dietary transitions are taking place. The significant association found between unhealthy dietary patterns and elevated indicators of NCD risk, such as high body mass index (BMI) and increased systolic blood pressure, highlights how critical the adolescent period is in shaping long-term health outcomes. Specifically, adolescents who frequently consumed fast food, sugary drinks, and high-fat snacks were found to be 2.7 times more likely to be at risk of developing NCDs compared to their peers who followed healthier eating habits, which included a diet rich in fruits, vegetables, and whole grains. This not only signals an urgent call to action for health policymakers but also emphasizes the responsibility of schools, families, and communities in promoting healthier environments for young people. Given that adolescence is a formative stage for establishing lifelong behaviors, interventions targeting this age group have the potential to yield significant long-term benefits. Therefore, comprehensive, school-based nutritional education programs and broader health promotion strategies should be prioritized as part of public health efforts in Mataram and similar urban settings. These interventions should aim not only to raise awareness about the dangers of poor dietary choices but also to actively support adolescents in making healthier food decisions through access to nutritious meals, physical activity programs, and

ongoing guidance from health professionals. By addressing dietary risk factors early, it is possible to reduce the future burden of NCDs, foster a healthier generation, and ultimately contribute to the sustainability of the healthcare system.

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