SCRIPTA SCORE Scientific Medical Journal Vol. 7 No. 2 (2026) 174–179

talenta PUBLISHER

SCRIPTA SCORE Scientific Medical Journal
Journal homepage: https://talenta.usu.ac.id/scripta

Behavior of Generation Z, Obesity, and Chronic Kidney Disease among Children and Adolescents: A Literature Review

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ARTICLE INFO

Article history:
Received 27 August 2025
Revised 16 February 2026
Accepted 19 February 2026
Available online 23 February 2026

E-ISSN: 2686-0864
P-ISSN: 2088-8686

How to cite:

Al Furqon, Ridha R. Behavior of Generation Z, Obesity, and Chronic Kidney Disease among Children and Adolescents: A Literature Review. SCRIPTA SCORE Sci Med J. 2026 Feb 23;7(2):174-179

https://doi.org/10.32734/scripta.v7i1.22594

ABSTRACT

Background: Generation Z is defined as individuals born between 1995 and 2010. Being raised in digital era, some lifestyle of Generation Z in nutritional fulfillment and physical activity raises concern about obesity and chronic kidney disease (CKD). **Objectives:** This review looked into role of behavior in obesity and chronic kidney disease in Generation Z. **Methods:** Search strategy was done using keywords, such as "obesity", "chronic kidney disease", "children", "adolescent", and "generation Z" in several search engines, including Pubmed, ScienceDirect, and Google Scholar. **Discussion:** Ease of digital access, including instant meal order, makes Generation Z tend to have high calorie food intake, but with minimal physical activity. The imbalance of daily energy expenditure contributes to obesity. Obesity consequently triggers neurohormonal pathways leading to chronic kidney damage. **Conclusion:** Preventive measures should be taken, including healthy eating habits, daily water intake, and engaging in more physical activity.
Keyword: adolescent, children, chronic kidney disease, generation Z, obesity

ABSTRAK

Latar Belakang: Generasi Z adalah individu yang lahir antara tahun 1995 hingga 2010. Hidup berkembang dalam era perkembangan digital, gaya hidup Generasi Z terutama yang berkaitan dengan asupan nutrisi dan aktivitas fisik meningkatkan risiko terjadinya obesitas dan penyakit ginjal kronik. **Tujuan:** Tinjauan pustaka ini menelaah peran gaya hidup dan perilaku terhadap terjadinya obesitas dan penyakit ginjal kronik pada Generasi Z. **Metode:** Telaah literatur dilakukan menggunakan kata kunci, "obesitas", "penyakit ginjal kronik", "anak", "remaja", dan "generasi Z" melalui mesin pencari, seperti Pubmed, ScienceDirect, dan Google Scholar. **Pembahasan:** Generasi Z cenderung memanfaatkan kemudahan akses digital, termasuk dalam mendapatkan makanan sehari-hari. Hal ini umumnya menyebabkan asupan kalori berlebih dengan aktivitas fisik yang minimal. Ketidakseimbangan tersebut menjadi penyebab utama obesitas, yang kemudian dapat merangsang mekanisme neurohormal tubuh yang berakhir pada kerusakan ginjal kronik. **Kesimpulan :** Pencegahan obesitas dan penyakit ginjal kronik, seharusnya dapat dilakukan dengan melaksanakan pola makan yang sehat, asupan air yang cukup, dan meningkatkan aktivitas fisik.
Kata kunci: anak, generasi Z, obesitas, penyakit ginjal kronik, remaja

1. Introduction

Chronic kidney disease (CKD) is defined as a permanent kidney abnormality that lasts longer than three months and is characterized by abnormal kidney structure or function, with or without a decline in glomerular filtration rate (eGFR < 60 mL/min/1.73 m2), depending on the presence of pathological or sign damage kidney, such as abnormalities in blood or urine composition or abnormalities on laboratory examination.[1]

An estimated 850 million people worldwide suffer from kidney disease, and 55–70 million children suffer from chronic kidney failure. The primary causes of CKD are varied, including diabetes, hypertension,

glomerulonephritis, pyelonephritis, chronic use of anti-inflammatory drug, autoimmune disease, polycystic kidney disease, Alport's disease, and congenital malformations.[2]

The occurrence of CKD has gained attention because it recently occurs in young people, particularly in Generation Z (Gen Z), which is defined as those born between 1995 and 2010 and has all-around habits, including using gadgets and not exercising. Born between 1995 and 2010, Generation Z was heavily influenced by digital media, particularly as digital natives. Their excessive use of social media also leads to behavior addiction known as social networking addiction.[3]

In his book "Raising Children in the Digital Era," psychologist Elizabeth Santoso lists seven traits that define Generation Z (also known as the "i-generation" or "kids nowadays"), who were born in this digital age: having a strong desire for success, acting quickly, loving freedom, believing in oneself, wanting to get confessions, being close to digital technology, and enjoying details.[4]

Sedentary behavior of an individual is often related to obesity. In particular, the fast-paced, hectic lifestyle of Generation Z leads to a tendency to consume unhealthy foods that are heavy in fat and cholesterol. Convenience technology and mobility in daily life are also contributing factors to Generation Z's lack of physical activity. The primary cause of obesity is an imbalance between caloric intake and production.[5,6] According to data from 2022, there were 94.2 million kid males and 65.1 million child females worldwide who were obese. There are now 51.2 million child women and 76.7 million child men, up from 1990.[7]

Childhood and adolescent obesity is closely associated with renal chronic illness. This has to do with the neurohormonal effects of the network of adipose tissue in the renal glomerulus and systemic circulation.[8] Furthermore, obesity is a risk factor for various conditions that can be linked to renal illness, including kidney stones, hypertension, and urinary tract infections.[9] According to data, 12.5% of European children aged 0 to 15 receiving hemodialysis or kidney transplants are obese.[10] This literature review will explore behavior and lifestyle of generation Z and its relation with obesity and chronic kidney disease among children and adolescent.

2. Methods

The literature search for this review was performed using keywords, such as “obesity”, “chronic kidney disease”, “children”, “adolescent”, and “generation Z”. The search was done in several search engines, including Pubmed, ScienceDirect and Google Scholar.

3. Discussion

3.1 Obesity-related behavior of Generation Z

The characteristics of generation Z include a high tofu demand, quick adaptation to new technologies, multitasking, lack of patience, a tendency to solve problems quickly, a tendency to speak and communicate vocally less, and a tendency to be sensitive to their surroundings. Generation Z interacts with technology heavily and was raised in an era of technological advancement. This is the reason that members of Generation Z are addicted to using technology, such as smartphones, laptops, computers, and the internet, and they are also less active physically.[11]

In 2018, *Riset Kesehatan Dasar* (Riskesdas) in Indonesia found that 9.5% of adolescents aged 16-18 was overweight, and 4% had obesity.[12] Generation Z's surplus nutritional status is largely impacted by their eating habits and way of living. Low physical activity combined with high calorie intake habits results in a surplus of calories, which leads to fat storage. In the end, this will result in an improvement in body weight.[13] Globalization has a significant impact on how Generation Z consumes food. The internet is a source of information that Generation Z may access and use to learn about foreign foods. Furthermore, the Korean wave has influenced generation Z's consumption and way of life, particularly in the areas of food and fashion. As technology advances, Generation Z finds it easier to order food.[14] E-wallet development is also growing, making it easier for Generation Z to order food because it's easier and they tend to look for e-wallet promos.[15] Compared to the pattern of three main meals, generation Z tends to choose to eat snacks and small meals more frequently. This is purportedly due to the busy people's manner life. Light food is frequently seen to be easier to obtain and can be eaten while engaging in various activities, such as traveling.[11]

This generation is likewise at ease with technology and mainly relies on internet resources for food-related activities. They frequently purchase food online and use food delivery apps. Among the factors that

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significantly impact someone's intention to use an application for food delivery are customer experience, restaurant search, facility utilization, and listing.[16,17]

3.2 Obesity and Chronic Kidney Disease

Globally, there are approximately 697.5 million cases of CKD in 2017, accounting for 9.1% of world population.[18] However, estimating CKD cases among children and adolescent is complicated, because most of studies evaluating CKD in children and adolescent had a small sample size or only took into account patient with end-stage renal disease. A study estimated that incidence of children CKD in several European countries was about 11 to 12 cases in 1 million population.[19] Another study comparing children CKD cases from 1990 to 2019 showed an increase in incidence and prevalence of CKD.[20]

A number of risk factors are associated with CKD progression, such as hypertension, dyslipidemia, and hyperuricemia. These risk factors may contribute in inflammation of glomeruli, tubuli, and interstitial tissue in the kidney, resulting in injury of nephrons. Nephron injury would cause morphological changes of kidney tissue, including glomerulosclerosis and tubulointerstitial fibrosis.[21] These changes would induce maladaptive response from functional nephrons, such as glomerular hypertrophy, glomerular hyperfiltration, podocyte hypertrophy, and kidney tubule hypertrophy. As the injury progressed further, the maladaptive response, which is initially intended to maintain normal kidney function, would eventually augment the nephron injury involving functional nephrons and advancing the CKD progression.[22]

As one of CKD risk factors, obesity contributes in creating low-grade chronic inflammation. Excessive adipose tissue found in an obese person, is generally unresponsive to insulin stimulus, hence it does not do the role of normal adipose tissue in regulating lipid metabolism. This results in lipid accumulation in organs, such as liver and kidney, and creating lipotoxicity. The lipotoxicity and chronic inflammation are mediated by cytokines secreted by the adipose tissue, called adipokines. Adipokines have direct consequences on inflammation, lipid metabolism, insulin resistance, atherosclerosis, and cell proliferation (Figure 1).[8,23]

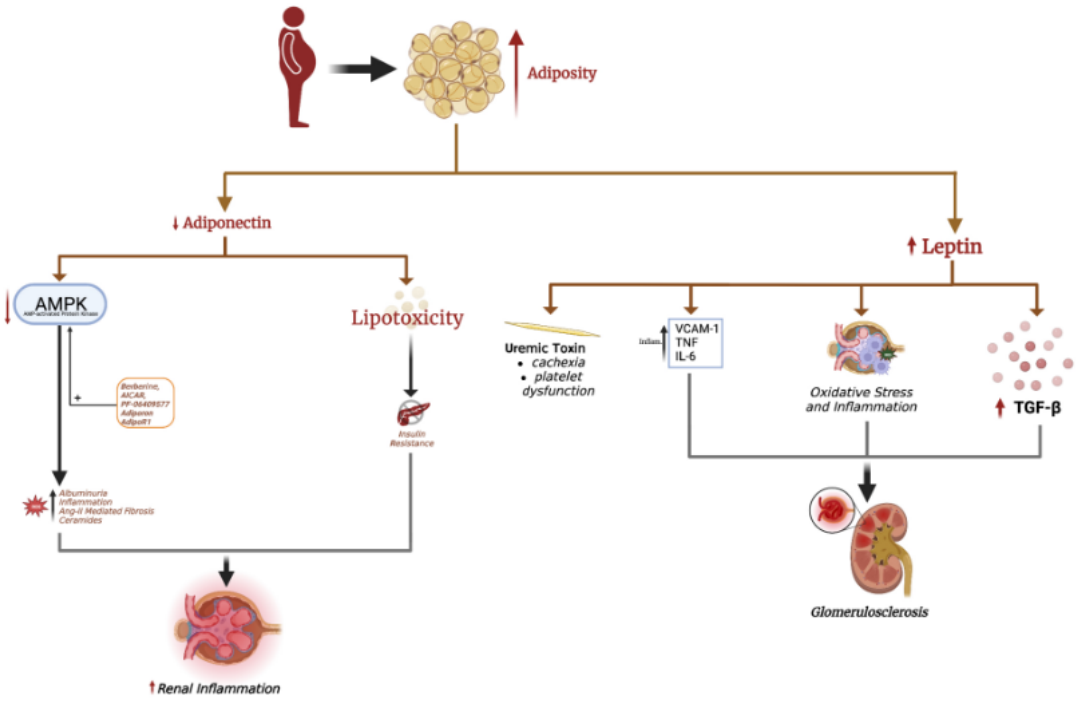

Figure 1. Role of adiposity and its associated adipokines in kidney damage and other organ dysfunction[23]

One of the adipokines that the adipose tissue produces that can harm the kidneys is leptin. Leptin secretion helps to boost energy expenditure and promote satiety in conditions where there is an excess of nutrients consumed. Obesity is linked to hyperleptinemia, which is about five to ten times the normal amount, and leptin resistance because it produces a large amount of leptin but does not work efficiently. In relation to its effects on the kidneys, leptin causes glomerulosclerosis by inducing the glomerulus to produce more collagen type

IV, fibronectin, and TGF-β1 secretion. Furthermore, leptin leads to further inflammation in the kidneys and modification of glomerular vascularization by disrupting the network endothelium in the glomerulus through increased production of ICAM-1 and VCAM-1. Leptin-induced improvement in IL-6 and TNF-α release by monocytes causes inflammation in the kidney's tubules as well. Leptin is a molecule whose excretion is dependent on kidney function; hence, hyperleptinemia and disruption of leptin secretion occur in patients with chronic renal disease. This leptin accumulation, is considered as one of uremic toxins, and results in cachexia, insulin resistance, hypertension, cardiovascular illnesses, and abnormalities of bone metabolism commonly found in patients with chronic kidney disease.[23]

The adipose tissue also produces another adipokine called adiponectin. However, under the conditions of obesity, adiponectin secretion declines. In order to prevent fat buildup and lipotoxicity, adiponectin works to boost the beta oxidation of lipids. Additionally, adiponectin increases insulin sensitivity and contributes to fat storage in adipose tissue. Decreased adiponectin levels results in insulin resistance and lipotoxicity in obesity. Adiponectin stimulation receptors (ADIPOR1 and ADIPOR2) in the kidney will reduce the degree of glomerulosclerosis, fibrosis, and inflammation in the kidneys. Consequently, decreased adiponectin may contribute to increased renal inflammation.[23]

3.3 Prevention of Obesity and CKD

In order to prevent obesity, it is advised that children's behavior, eating habits, and physical activity be monitored. A meta-analysis of 359 studies assessing the prevention of childhood and teenage obesity reveals that a combination of behavioral, physical, and dietary interventions can reduce the z-score index mass body.[24] Associated with lifestyle modification, media exposure (including television and devices) during meal time is associated with higher calorie intake. In addition, children that are exposed to media spend less time sleeping overall.[25] Thus, it is advised to schedule children's media use and preventing them from eating while watching television or similar devices.[26]

In relation to meal patterns, Indonesian Pediatric Society (*Ikatan Dokter Anak Indonesia* / IDAI) suggests a calorie-dense diet tailored to children's typical requirements. balanced diet consisting of 50–60% carbohydrates, 30 percent fat, and 15–20% protein to support optimal growth. In the other hand, it is advised that children with obesity cut back on their daily caloric intake by 200–500 calories, with a weekly weight loss goal of 0.5 kg. target weight until it is around 20% higher than the ideal body weight or is sufficiently maintained to avoid increasing since linear growth is still occurring.[26]

Prevention of obesity is also advised, along with appropriate physical activity patterns and an attempt to balance energy intake and expenditure. It is advised that children and adolescents engage in aerobic exercise for at least sixty minutes each day. There are two types of aerobic exercise: moderate and high intensity. This type of exercise can be performed at least three times in a week. Aerobic exercises, particularly for children, can be included into leisure or play activities. In addition, it is advised to engage in muscle-strengthening exercises like gymnastics, climbing, and push-ups as well as bone-strengthening exercises like jumping and jump rope for at least 60 minutes each day (Table 1).[26]

Drinking enough water is advised to stay hydrated and prevent chronic kidney disease. A 24-hour urine volume over 3 liters is associated negatively with the risk of renal decline, according to a study that shows good hydration condition.[27] However, avoid drinking too much milk or sugary beverages to prevent obesity.[26] Drinks with high sugar content are linked to chronic renal disease risk incidents.[28]

Table 1. Examples of physical activity recommendation for children and adolescent[26]

Type of physical activity	Examples for children age group	Examples for adolescents age group
Moderate intensity aerobic exercise	◗ Active recreation, such as hiking, skateboarding or roller-skating	◗ Recreation active, such as canoeing, hiking, skiing, skateboarding or roller-skating ◗ Race walking ◗ Bicycle ◗ Do house chores, such as sweep or push machine cutter grass

		◦ Sports with throwing and catching movement, such as baseball, softball, basketball, and volleyball
High intensity aerobic exercise	◦ Active playing, such as run and chase ◦ Bicycle ● Jump rope ◦ Martial arts, such as karate ◦ Running ◦ Sports, such as ice hockey or field, basketball, swimming, tennis, or gymnastics	◦ Play active running and chasing, like football ◦ Bicycle ● Jump rope ◦ Martial arts, such as karate ◦ Running ◦ Sports, such as tennis, ice hockey or soccer field, basketball, swimming ◦ Dance ◦ Aerobics ◦ Cheerleading or gymnastics
Muscle strengthening exercise	◦ Tug of war ◦ Modified push-up (with knees on the floor) ◦ Resistance training using body weight or resistance band ◦ Climbing rope or tree ◦ Sit-ups ◦ Swinging on play equipment ◦ Gymnastics	◦ Tug of war ◦ Push-ups ◦ Resistance training using exercise bands, loads or weights ◦ Climb cliff ◦ Sit-ups ◦ Cheerleading or gymnastics
Bone strengthening exercise	● Jumping, skipping ● Jump rope ● Running ● Sports, such as gymnastics, basketball, volleyball, tennis	◦ Jumping, skipping ◦ Jump rope ◦ Running ◦ Sports, such as gymnastics, basketball, volleyball, tennis

4. Conclusion

Gen Z is a close-knit generation that is constantly surrounded by technology and at high risk for obesity. One of the risk factors for the development of CKD is obesity, which arises from a variety of neurohormonal pathways. The rising number of obesity in Generation Z is also followed by increase in CKD among children and adolescent. Changes in behavior, such as dietary habits, physical activity, water intake, and sleep patterns, can lead to chronic kidney disease in children.

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