

Epidemiological Transition in Indonesia and Its Prevention: A Narrative Review

ABSTRACT

Introduction: Indonesia is undergoing an epidemiological transition, changing from a public health problem with the prevalence of a dominant infectious disease to a non-communicable disease. Some of the causes of this transition include technological advances, economy, modern transportation, lifestyle, changes in food consumption and others

Objective: This paper aims to describe epidemiological transition and its prevention in Indonesia.

Method: A narrative review was conducted by searching in databases including Web of Science, PubMed, Scopus, and Google Scholar search engine from 2001 to 2020 with the following search terms: nutrition transition, dietary transition, shifting epidemiology, epidemiological transition.

Result: Indonesia has experienced the epidemiological transition from infections to non-communicable diseases (NCDs). All types of NCDs have increased in the last three decades. NCDs also occur among the younger population despite preventability. The promotion of healthy lives and well-being to decrease NCDs in Indonesia delivered through early detection of their risk factors through Integrated Guidance Post (Posbindu)

Conclusion: An epidemiological shift has occurred in Indonesia. In the 1990s, infectious diseases outnumbered but however, noncommunicable diseases will be the most common, by the 2020s. Early detection is required to prevent their development.

Keywords: epidemiology, transition, NCDs, review, prevention

1. INTRODUCTION

The transition of epidemiology is a shift in health problems and public health, from nutrition-related problems in infectious to non-infectious diseases or NCDs[1]. In the past, health problems and infections were generally due to the body's low resistance to disease causes and susceptibility to infection[2].

Malnutrition and NCDs are now mainly related to lifestyle. A diet high in carbohydrates, protein, fat, and low fibre and a sedentary lifestyle (e.g., excessive sitting, less physical activity) is the cause of weight gain and the onset of the occurrence of non-communicable diseases[3]. Several factors related to the nutritional shift include economic growth, modern technology, transportation, lifestyle, demography, and long consequences of life expectancy rate[4], [5]. Abdel Omran first published the theory of epidemiology transitional in 1971[1]. Conceptually, burden malnutrition affected primary mortality and morbidity, shifting from communicable diseases to NCDs[1]. The original formulation of Omran's Five propositions includes 1) The theory of epidemiologic transition, which begins with the principal premise that mortality is based on factors. 2) During the transition, a long-term shift occurs in mortality and disease patterns whereby pandemics of infection are gradually displaced by degenerative as the primary cause of death. 3) During the epidemiologic transition, the most profound changes in health and disease patterns obtain among children and young women, 4) The shifts in health and disease patterns that characterize the epidemiologic transition are closely associated with the demographic and socioeconomic transitions and modernization, 5) Three basic models of the epidemiologic transition.

In Indonesia, almost all diseases related to nutrition shifting are increasing. For example, the prevalence of obesity, diabetes mellitus, hypertension, stroke, cancer, and kidney has risen in the last few surveys, as detailed in Fig 1.

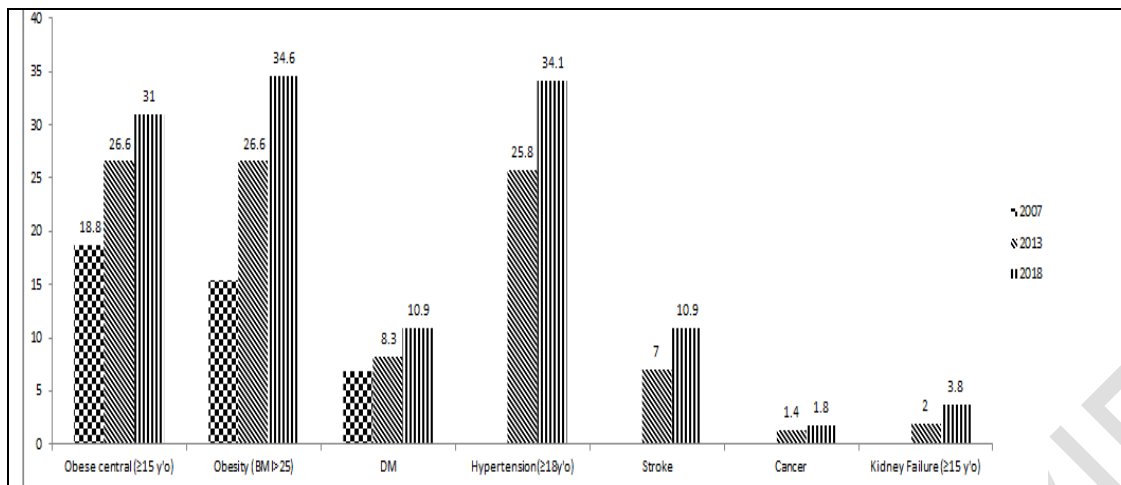


Fig 1. The trend of NCDs in Indonesia from 2007-to 2018
Source: Ministry of Health, 2018

This study aimed to describe epidemiological transition and its prevention, which is an important issue, provide the future strategy for best overcoming NCDs, and contribute literature.

2. METHODS

We performed a literature search of published manuscripts on nutritional and epidemiology. A literature review was conducted by searching the materials published in databases including Web of Science, PubMed, Scopus, and Google Scholar search engine from 2001 to 2020 with the following search terms: nutrition transition, dietary transition, shifting epidemiology, epidemiological transition. Verbatim key messages were organized by prevalence (non communicable diseases, communicable diseases, injuries), determinant (growth economics, technology and urbanization, also lifestyle and food pattern changes, and prevention (medical check-up, prevent smoke, physical activity, balance diet, sleep and stress management).

3. RESULTS AND DISCUSSION

3.1. Nutritional and epidemiological transitions in Indonesia

Epidemiological transition is a change in the prevalence of public health problems from infectious diseases to non-communicable diseases. It is strongly related to modernization, technological progress, transportation, economic improvement, demographic changes and shifts in life expectancy[1], [2], [6]. Progress in the field of transportation, for example, currently various alternative modes of transportation for school children and adults/workers are vast, and there is a shift from active modes of transportation such as walking and bicycles to passive modes of transportation such as driving. This phenomenon also occurs in other countries such as Amerika Serikat[7], [8], Netherland[9], Columbia[10] and other countries including Indonesia[11], [12]. In the nutrition sector, this shift was observed from the 1970s until now in the form of increased processed foods, vegetable oils, sweet foods, pasta foods and western foods, and a reduction in physical activity[13]. This change began to appear in the 1990s with the emergence of diabetes, hypertension, and obesity globally, especially in low-income countries[13]. In the medical sector, the discovery of drugs, laboratory research, and advanced technologies allow society to detect disease prevention, reduce disability and dependence on medicine, and premature death[14], [15].

Globally, there are three phases of epidemiology transition in developing countries, including Indonesia[6]: a) The age of pestilence and famine/outbreak and starvation phase (17th to 20th century). In this phase, the mortality rate is high, even life expectancy is below 40 years old, and growth people uncontrol. Diseases causal are bacteria, malnutrition, endemic and communicable diseases; b) The age of receding pandemics/Endemic decline. Middle of 20 century- in this phase, the mortality rate decreased and followed the increasing life expectancy rate by 55 years old. This shifting was from communicable to NCDs; c) The age of triple health burden. Occurring by the end of the 20th and early 21st centuries, this phase is characterized by common nutritional problems (infection, malnutrition, and maternal death); an increase in non-communicable diseases (such as cancer, diabetes, heart disease, and mental illness) and new-emerging diseases (in the form of health problems related to globalization, climate change and lifestyle).

Globally, the epidemiological transition is being experienced by several countries in the world[4], as detailed in Fig. 2.

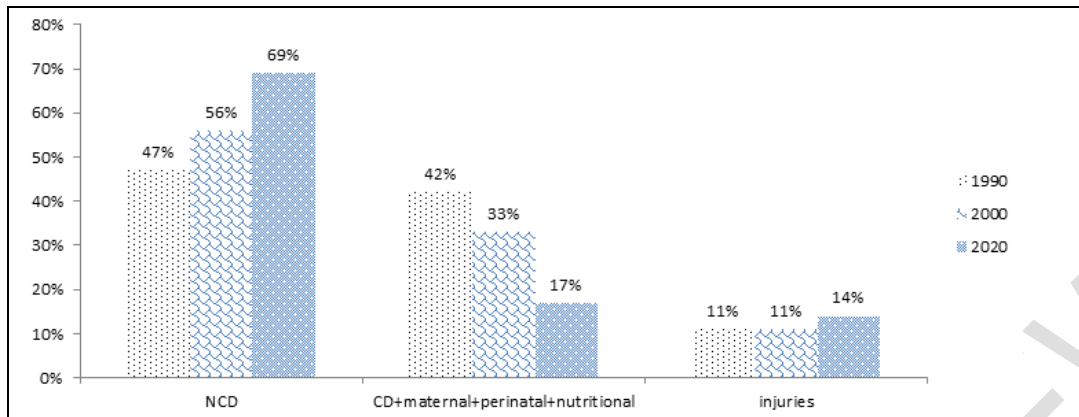


Fig 2. The transition of disease epidemiology in some developing countries in the world
Source: doi 10.1186/1475-9276-4-2

In Indonesia, based on surveys from 1990-to 2015, Indonesia is also experiencing changes in disease patterns (Fig 3).

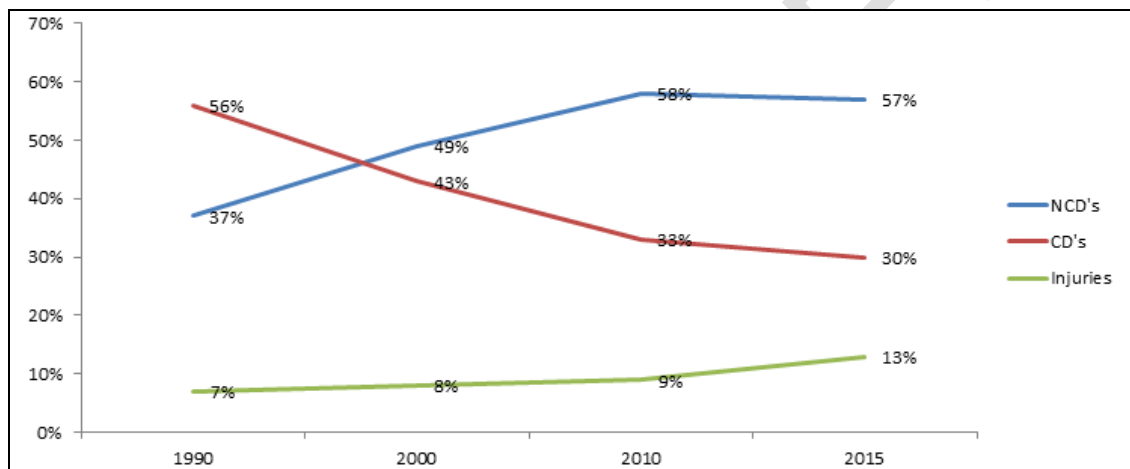


Fig 3. Epidemiological transition in Indonesia
Source: <https://www.cdc.gov/globalhealth/health>

3.2. Determinant of transitional nutrition epidemiology

The ecological theory predicts how the epidemiological transition began [16]. This theory states that non-communicable diseases experienced by a person occur because of their behaviour over many years, from when they were children to adults [1], [17]. Such behaviour leads to the development of excess weight (Fig 4).

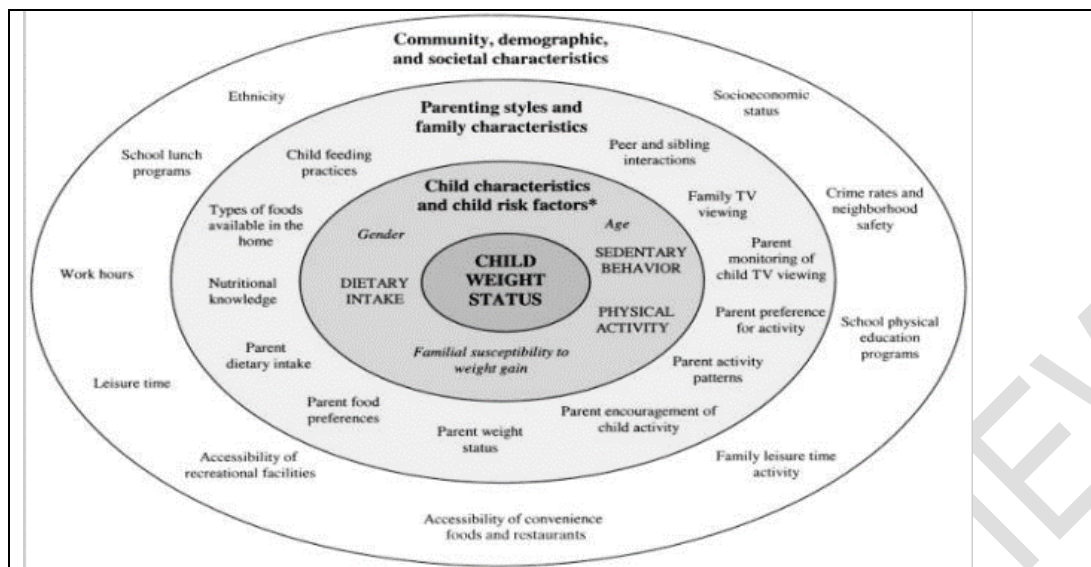


Fig 4. The theory of ecological NCDs
 Source: <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2530932/>

Several factors affect shifting epidemiology, as follows:

3.2.1. Growth economics, technology and urbanization

The social-economic and environmental surrounding is close factor-related to obesity. Better economic status is considering risk factors diet change from a high fibre diet to low fibre and high-calorie intake[18]. The economic situation affects a good diet by following good nutrition and health knowledge[19], [20].

Urbanization impacts obesity by causing people to have better economic levels, the capability to pay, and food access, and are more likely to have a sedentary lifestyle [18]. A simple illustration is when people live in their villages, spending a lot of time farming, gardening, raising livestock, walking, using bicycle transportation, and other physical activities. However, this activity is no longer continued when moving to a city. As a result, energy expenditure is reduced and leads to overweight[21].

On the one hand, technological developments are increasingly rapid and provide extraordinary benefits in everyday life, including in the health sector. However, on the other hand, technological developments have contributed to an increase in life expectancy while at the same time increasing the prevalence of non-communicable diseases, which now suffer a lot in the productive age population[22].

Modern Technological developments also improve transportation modes, resulting in a shift in energy expenditure. At school age, we can observe this using active transportation such as walking, cycling, or public transportation, switching to passive transport such as riding a motorbike or private car. Technology is associated with reduced physical activity, especially at a young age. If children spent a lot of time watching television in the past, now they play a lot with gadgets and laptops, contributing to the emergence of sitting disease, social problems, and mental health. The existence of food advertisements and food delivery services also contributes to obesity and a sedentary lifestyle. Of course, this habit provides an opportunity for non-communicable diseases earlier[23], [24].

3.2.2. Lifestyle and food pattern changes

The transition of nutritional epidemiology is influenced by consumption patterns, namely the shift in consumption from traditional to western consumption patterns, which tend to be high in carbohydrates, saturated fat, trans fat, multi-processed manufactured foods and hydrogenated fats[25]. This weight gain tends to occur in families with low economic income. They tend to choose foods high in carbohydrates and fat (high carbo-high fat) with relatively affordable prices[26]. Basic Health Survey (Riskesdas) 2018 showed that 95.5% of Indonesian people >5 years old had consumed fewer fruits and vegetables[27]. Fruits and vegetables provide a source of fibre in the daily diet, making the fullness last longer. A high fibre diet decreases the risk of obesity[28], DM incidence, lower blood glucosa[29]; prevent hypertension[30]; CVD[31]; cancer[32], and stroke[33].

During the COVID-19 pandemic, several studies stated that eating disorders occurred as a coping mechanism or emotional eating to release anxiety due to the impact of the pandemic, which is related to an increase in food intake, resulting in overweight and obesity[34]. In general, adolescents choose unhealthy foods like sugary, salty, and fast foods

that contribute to weight gain[35]. In addition, western food advertisements offer variants, new flavours, and affordable prices to increase consumers' appetites, which later correlated with an increase in central obesity and the risk of NCD[36].

Sedentary behaviour contributes to the increase in the obesity—a state of entry for the occurrence of NCDs. A sedentary lifestyle is related to low energy expenditure. The 2018 Riskesdas has reported that sufficient routine exercise is only carried out by 33.5% of the ten-year-old Indonesian population [27]. The research results on young adult subjects stated that the COVID-19 pandemic was associated with decreased physical activity, increased sedentary lifestyle and extended sleep duration[37].

With the COVID-19 pandemic, many children study at home using their cellphones or computers. This situation impacts reducing the energy that comes out because of excessive sitting or lying down. In addition, they tend to extend the time they use their cellphones/laptops to play games or have fun with their cellphones[38]. On the one hand, cellphone utilization can impact mental[39] and cope with eating as its compensation[40]. All of these factors contribute mutually to obesity at an early age. Apart from cell phones, watching television for a long time is also associated with the risk of being overweight[41]–[43] and selecting passive transportation modes for school-age children[44]–[46]. Both changes in diet and a sedentary lifestyle can simultaneously cause fat deposits to become central obesity in all age groups, both in rural and urban areas[47].

4. NON-COMMUNICABLE DISEASES PREVENTION

Almost all non-communicable diseases are preventable through various efforts such as a healthy lifestyle, good diet, optimal stress management, risk factor control and early detection of NCDs[4], [5]. Therefore, the Indonesian Ministry of Health has released the famous acronym “CERDIK”, a memorable slogan to prevent NCDs. CERDIK stands for regular health monitoring, avoiding cigarette smoke, routine physical activity, a well-balanced diet, sleeping enough, and managing stress.

4.1. Routine Medical Check-Up

At the community level, prevention of NCDs is carried out with community-based health efforts through Integrated post services for NCDs (Posbindu PTM). Activities di Posbindu PTM include five service desks: include registration, risk factor interviews, anthropometric measurements, checking blood pressure and blood sugar, counselling, education, and follow-up[48].

Hence Posbindu PTM is held monthly. However, the monitoring frequency depends on early detection results, as detailed in Table 1.

Table 1. The frequency and time of monitoring risk factors

Risk factors	Healthy people	People with risk factors	People with NCD
Fasting blood glucose	Every three year	Yearly	Monthly
2 hours postprandial blood glucose	Every three year	Yearly	Monthly
Random blood glucose	Every three year	Yearly	Monthly
Total cholesterol	Every three year	Every six month	Every three month
Trygleseride	Every five year	Every six month	Every three month
Blood tension	Monthly	Monthly	Monthly
BMI	Monthly	Monthly	Monthly
Waist circumference	Monthly	Monthly	Monthly

Source: Ministry of health, 2019

4.2. Prevent smoke exposure

Smoking is a severe public health problem in Indonesia and several countries globally. The number of smokers in Indonesia continues to increase, and the age of first smokers shifts to a younger generation. In Indonesia, based on the 2013 and 2018 Riskesdas survey, the prevalence of smokers after >10 years old has increased from 28.8% to 29.3%. In detail, smokers aged 8-10 years old in Indonesia increased by 7.2% in 2013[49] to 8.8% in 2016[50] and 9.1% in 2018[27]. Even Indonesia is the highest prevalence of adult smokers country in ASEAN, with as many as (33%)[52] and the third rank biggest smokers in the world after China dan Rusia[53] and the youngest smokers in the world[53]. Globally, more than 8 million people die every year, 7 million due to active smoking and 1.2 million due to passive smoking. It is estimated that the number of deaths due to smoking will be more than 9 million in 2030, with the highest number of fatalities in middle-poor countries[54].

Several studies have proven the link between smoking habits and the development of non-communicable diseases[54], [55]. For example, smoking increases the risk of obesity as in studies in the United Kingdom among adults [56], West Iraq at the age of 35-65 years old[57], and women aged 40-70 years old in Norwegia[58].

WHO has provided practical and cost-effective strategies to improve smoking prevention through MPOWER, with details: **M**onitor tobacco use and prevention policies, **P**rotect people from tobacco use, **O**ffer help to quit tobacco use, **W**arn about

the dangers of tobacco, Enforce bans on tobacco advertising, promotion and sponsorship, Raise taxes on tobacco[54]. However, according to WHO, only Brazil and Turkey have fully implemented the MPOWER method with the highest achievement indicators among other countries.

4.3. Physical activity

Exercise is a message of balanced nutrition. Exercise can increase energy expenditure, reduce the risk of obesity, increase fitness, productivity[59] and stress release[60]. In addition, exercise is correlated with controlling weight gain, blood sugar levels[61], improving profile lipide[62], preventing hypertension, preventing coronary heart diseases and blood vessels[63], increasing fitness level[45], [64], dan body flexibility[65]. The recommendation for exercise is 30 minutes per day for five days a week. Exercise does not just expend energy, such as homework activities, but a physical activity that can increase cardiovascular performance[66].

4.4. Balance diet

We have Balanced Nutrition Guidelines on control the diet-related issues, including four main pillars: consumption of various foods, clean and healthy lifestyle, and maintaining body weight and physical activity. Balanced Nutrition Guidelines contain ten messages: 1) be grateful and enjoy the variety of food, 2) eat lots of vegetables and fruit, 3) eat protein, 4) eat vary of carbohydrates, 5) limit consumption of sweet, salty and fatty, 6) breakfast, 7) drinking safe water, 8) read the food labels, 9) wash your hands using soap and running water, 10) physical activity and maintain body weight. Research in Indonesia states that the consumption of rice and unhealthy foods in Indonesia must be reduced. In contrast, in terms of production, trade and food processing, it is necessary to prioritize diversification, bio-fortification, and stimulation of consumers in choosing, consuming and getting used to healthy and nutritious foods[67].

In general, properly balanced diet practices, increased physical activity, weight management, and abstinence from tobacco/substance use and alcohol play an improtant role in preventing and controlling NCD[68].

4.5. Sleep hours

Sleeping is a critical component of maintaining health and fitness. However, sleep includes both quantity and quality components, and the amount of sleep is different for each age group. For example, children (6-12 years old) need 10 hours, adolescents (12-18 years old) need 8-9 hours, adults (18-40 years old) need 7-8 hours and the elderly 6-7 hours. Meanwhile, sleep quality was measured by not often waking up when sleeping, waking up refreshed in the morning and sleeping easily 30 minutes after lying down.

Insufficient sleep is correlated with increased sympathetic nervous system activity, pituitary hypothalamus, metabolism, and altered immune response. In adulthood, short-term sleep disturbances are associated with increased stress responses, decreased quality of life, emotional and mood disturbances, cognitive decline, memory and performance. In adolescence, lack of sleep can cause mental health disorders, decreased cognitive function, learning achievement, and deviant behaviour. In the long term, disturbed sleep patterns can cause hypertension, dyslipidemia, metabolic syndrome, heart disease, weight gain, type 2 diabetes and gastrointestinal disorders[69].

4.6. Stress management

Chronic distress is associated with an increased risk of obesity and its comorbidities. Stress is related to behavioural regulation, endocrine system, metabolism, immune, and cardiovascular disease. Uncontrolled pressure and long-term/chronic causes of several pathological conditions, including anxiety, psychosomatic disorders, metabolic syndrome, behavioural disorders, osteoporosis and impaired immune function. Stress is characterized by emotional eating/eating disorders, choosing certain foods, difficulty sleeping, impulsive behaviour, anxiety, etc. Stress disrupts hormonal regulation, triggers the release of more cortisol and catecholamines, and increases insulin levels, resulting in central obesity, diabetes and metabolic syndrome. In children and adolescents who are developing, the secretion of cortisol due to stress can interfere with growth and development, cognitive, puberty and optimal body height[70]. In today's life, stress is unavoidable, so efforts are needed to release tension, for example, recreation, gardening, playing with pets, sharing hobbies, and so on[71]. In addition, we can do a self-assessment of mental health conditions. Various instruments can be downloaded for free. One of the instruments is the Patient Health Questionnaire-9 (PHQ-9), a psychometric tool often used for depression screening[72].

5. CONCLUSION

There has been an epidemiological transition. In the 1990s, infectious diseases were more prevalent than non-communicable diseases. But starting in the 2020s, the most prevalent diseases are non-communicable diseases such as obesity, DM, hypertension, heart disease, and stroke. NCDs are preventable diseases, but we need to provide early detection to prevent the development of NCDs. Preventing NCDs includes health status monitoring, avoiding tobacco, regular physical activity, a balanced diet, sleep quantity and quality, and stress management.

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ABBREVIATIONS

NCDs : Non communicable diseases

Posbindu **PTM** : Pos Pembinaan Terpadu **Penyakit Tidak Menular**