Review Article

Epidemiological Transition In Indonesia And It's Prevention: A Narative 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, changing on food consumption and others
Objective: aimed 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: As a result Indonesia experiencing in epidemiological transition from infections to NCDs. All type of NCD's was increase on the last 3 decades. NCDs also occur among the younger population despite preventability. The promotion of healthy lives and well-being to decrease NCD's in Indonesia delivered through early detection of it's risk on Integrated Guidance Post (Posbindu)

Keywords: epidemiology, transition, NCD's, review, prevention

1.INTRODUCTION

The transition of epidemiology is a shift in health problem 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 resistance to causes of disease is low and susceptible 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 phycisal activity) is the cause of weight gain, onset towards the occurrence of non-communicable diseases[3]. Several factors related to the nutritional shifting 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 including: 1) The theory of epidemiologic transition, this begins with the major premise that mortality is a based 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 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. The prevalence of obesity, diabetes mellitus, hypertension, stroke, cancer and kidney has continued increase from the last few surveys As detailed in Fig 1.

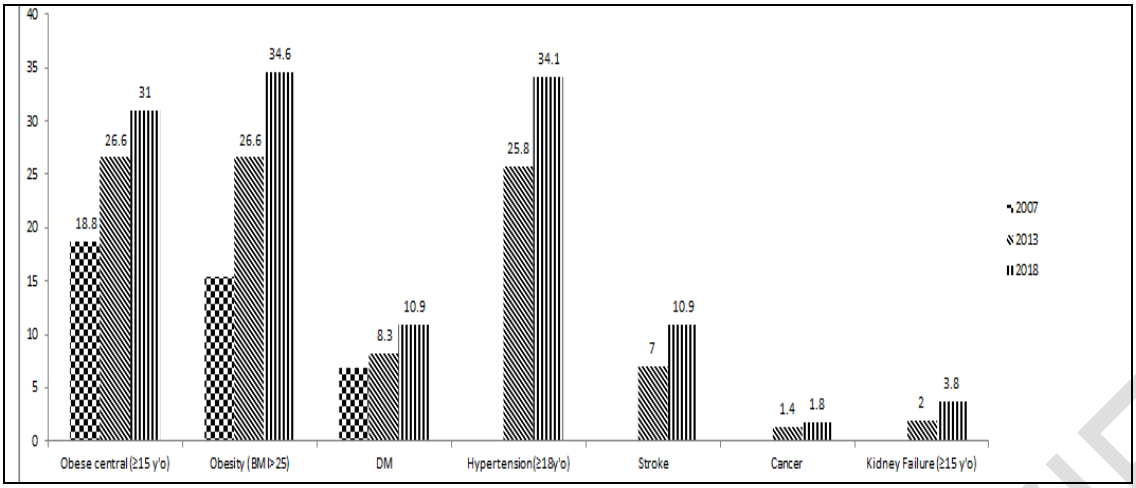

Fig 1. The trend of NCDs in Indonesia in 2007-2018
Source: Ministry of Health, 2018

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

2.METHODS

We performed a literature searching of published manuscripts on nutritional and epidemiological transition in Indonesia. 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.

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 very 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 others countries including Indonesia[11], [12].

In the sector of nutrition, this shift was observed since the 1970s until now in the form of increased processed foods, the use of vegetable oils, sweet foods, pasta foods and western foods, and accompanied by a reduction in physical activity[13]. The impact of this change began to be seen in the 1990s with the emergence of diabetes, hypertension, obesity globally in the world, especially in low-income countries[13].

In the medicine sector, discovery of drug, laboratory research, and an advanced technologies provide some opportunities for the society to make early detection of disease prevention, reduce disability and dependence of 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 (17^{th} to 20^{th} 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 20^{th} and early 21^{st} centuries, this phase is characterised by common nutritional problems (infection, malnutrition, and maternal death); 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 globalisation, climate change and lifestyle).

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

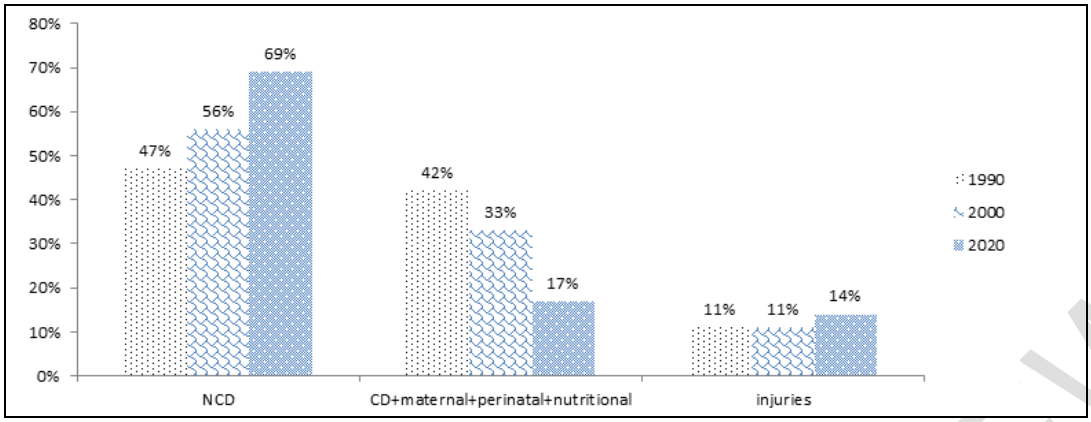

Fig 2. Transition of disease epidemiology in some developing countries in the world
Source: doi 10.1186/1475-9276-4-2

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

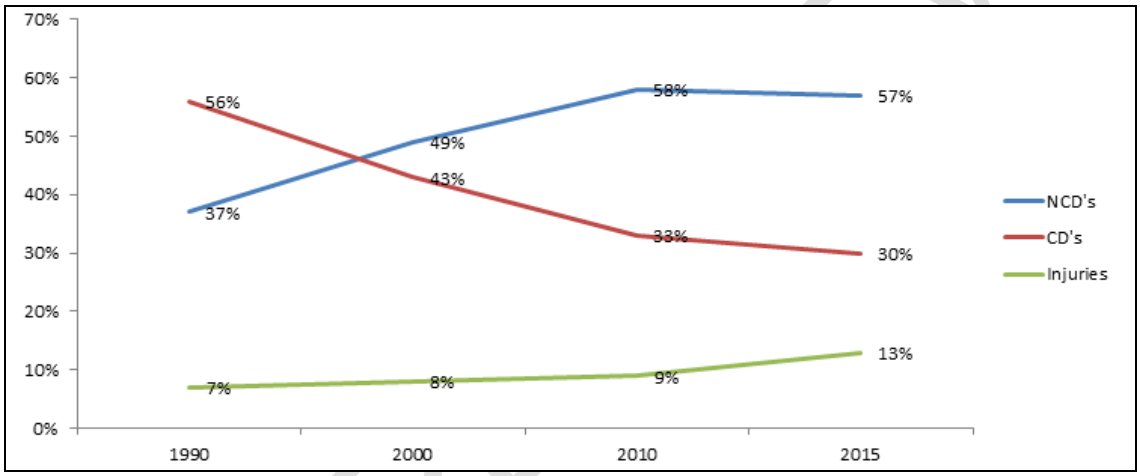

Fig 3. Epidemiological transition in Indonesia
Source: https://www.cdc.gov/globalhealth/health

3.2. Determinant of transitional nutrition epidemiology

The ecological theory predicts how the epidemiological transition was begin[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).

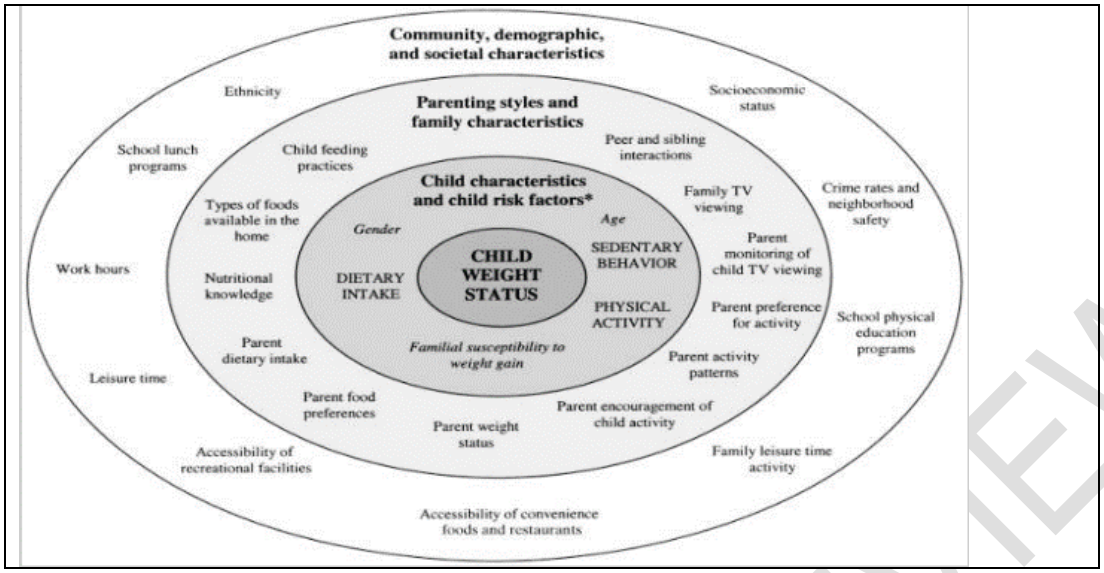

Fig 4. The theory of ecological NCD's
Source:https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2530932/

Several factors affect shifting epidemiology, as:

3.2.1.Growth economics, technology and urbanisation

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 when it follows good nutrition and health knowledge[19], [20].

Urbanisation has an impact on obesity also cause people to have better economic level, the capability to pay, food access, and are more likely to have a sedentary life style[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 the health sector. 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 consumpt 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 hypertention[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, adolescent people 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 of central obesity and risk of NCD's[36].

Sedentary behaviour contributes to the increase in 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 Indonesian population aged ten years[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 utilisation can impact mental[39] and cope eating as its compensation[40]. All of these factors contribute mutually to obesity at an early age. Apart from cellphones, 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 NCD's[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, good balanced diet, sleeping enough, and managing stress.

4.1. Medical Check Up Routinly

In community level, prevention of NCDs is carried out with community-based health efforts through Integrated post serviced for NCDs (Posbindu PTM). Activities di Posbindu PTM include 5 sevice 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 is depend 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's
Fasting blood glucose	Every 3 year	Yearly	Monthly
2 hours postprandial blood glucose	Every 3 year	Yearly	Monthly
Random blood glucose	Every 3 year	Yearly	Monthly
Total cholesterol	Every 3 year	Every 6 month	Every 3 month
Trygleseride	Every 5 year	Every 6 month	Every 3 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 a highest prevalence of adult smokers country in ASEAN 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].Smoking increases the risk of obesity as in studies in the United Kingdom at adult[56], West Iraq at the age of 35-65 years old[57], woman 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, **E**nforce bans on tobacco advertising, promotion and sponsorship, **R**aise taxes on tobacco[54]. According to WHO, only Brazil and Turkey have fully implemented the MPOWER method with the highest achievement indicators among other countries in the world.

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 hearth diseases and blood vessels[63], meningkatkan 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 performance4[66].

4.4.Balance diet

On diet issues, we have Balanced Nutrition Guidelines, including four main pillars: consumption of various foods, clean and healthy lifestyle, maintaining body weight and physical activity. Balanced Nutrition Guidelines contains 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 consumtion of rice and unhealthy foods in Indonesia must be reduce, while in terms of production, trade and food processing, it is necessary to prioritize divesification, bio-fortification, and stimulation of consumers in choosing, consuming and getting used to healthy and nutritious foods[67].

In general, proper balance diet practices, accompanied by increased physical activity, weight management, abstinence from tobacco/substance use and alcohol plays an improtant role in the prevention and control of NCD's[68].

4.5. Sleep hours

Sleeping is a critical component to maintaining health and fitness. Sleep includes both quantity and quality components, which the quantity of sleep is different for each age group. 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 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 characterised 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, 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]. 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), which is a psychometric instrument that is often used for depression screening[72].

5.CONCLUSION

There has been an epidemiological transition, in the 1990s infectious diseases is more prevalence than non communicable diseases. But starting in the 2020s the most prevalence of diseases are non-communicable diseases such as obesity, DM, hypertension, heart disease, stroke. NCDs is a preventable disease, but however we need to provide early detection to prevent the developing of NCDs. The preventing of NCDs including health status monitoring, avoid tobacco, regular physical activity, balance diet, sleep quantity and quality, and stress management.

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ABBREVIATIONS

NCD : Non communicable diseases
Posbindu : Pos Pembinaan Terpadu