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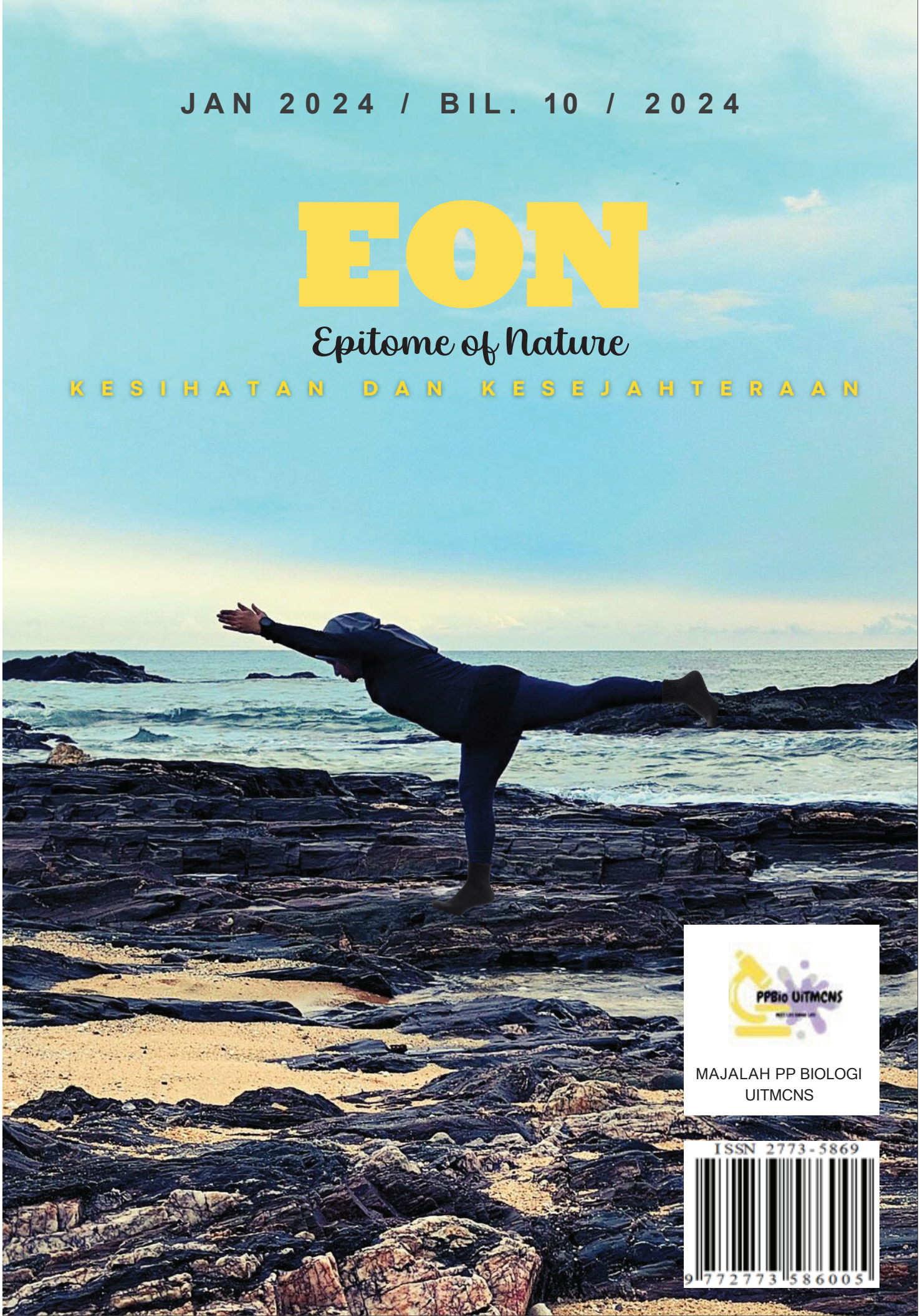

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CARDIOVASCULAR DISEASE

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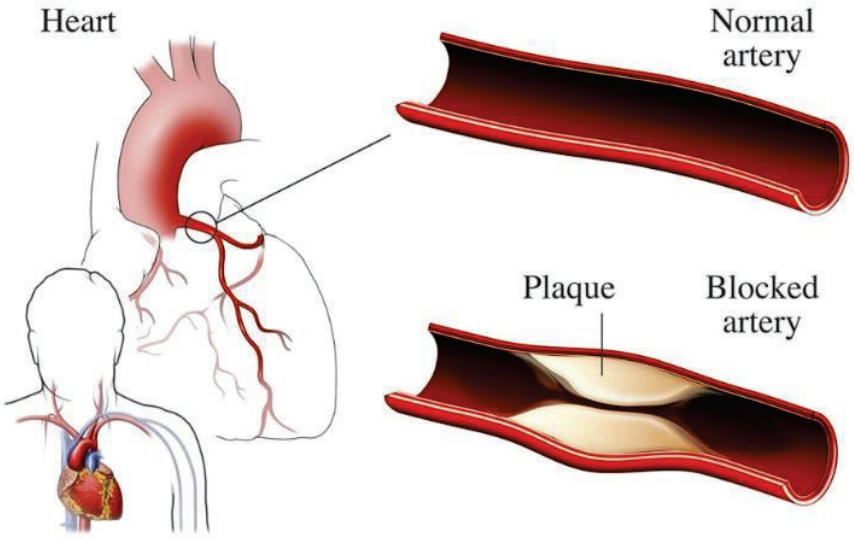

Figure 1: Build-up of plaque inside artery which caused coronary heart disease (Source: Coronary heart disease, 2022)

Cardiovascular disease (CVD) is associated with disorders of the heart and blood vessels consist of coronary heart disease, cerebrovascular disease, peripheral arterial disease, rheumatic disease, congenital heart disease, and deep vein thrombosis and pulmonary embolism (Blanchard & Miller, 1977; WHO, 2019; NHS, 2022). Symptoms of CVD eventually started from having chest pain or angina; then severe cases lead to heart attack or myocardial infarction (Kunnen & Van Eck, 2012; Jeong et al., 2018). Major causes of these phenomenon are due to the build-up of plaque around blood vessels which caused serious blockages in coronary artery, blood supply, limb arteries, and wall of the aorta as shown in figure 1 (NHS, 2019). Early signs of lipid blockages around blood vessels must be taken seriously including chest pain (angina), shortness of breath, dizziness, and exhaustion (Basson, 2008). Since 2005, CVD was reported responsible for 30% of mortality cases around the world (Basson, 2008, Chan et al., 2021). Statistics on the cause of death in Malaysia reported ischaemic heart disease as the top five death cases since 2014 (Statistics on causes of death Malaysia, 2022). It was reported, CVD occurrence acquired 13.7% of 157, 251 mortality cases as stated in Figure 2 (Firus Khan et al., 2022).

A majority of people aged 60 years and above are risked with CVD, and this risk is expected to increase by 2030, given that 15% of Malaysia's population comprises senior citizens (Chan et al., 2021). Based on the National Health and Morbidity Surveys (NHMS), the risk of CVD including hypertension, hypercholesterolemia, diabetes, overweight/obesity, and smoking shows an increasing trend over the years due to rapid urbanization and upgraded lifestyle (Sazlina et al., 2020; Firus Khan et al, 2022). Age is considered as non-modifiable risk factor of CVD since older people suffered from long term atherosclerosis (Sniderman & Furberg, 2008). Non – modifiable risk factor refers to uncontrolled factor of CVD such as age, gender, race, and family history (Sniderman & Furberg, 2008; Sazlina et al., 2020). However, Sniderman & Furberg (2008) believe that age factors can be upgraded into modifiable risk factor where older age can be hindered from having CVD through early prevention steps. This was supported by the NHMS prevalence study where future research should create ways or strategy to improvise older people's health (Sazlina et al., 2020). In comparison to older people, young adults (18-45 years) continue to develop risk factors of CVD, such as obesity, being physically inactive and high cholesterol diet over the past two decades (Anderson & Vasan, 2018).

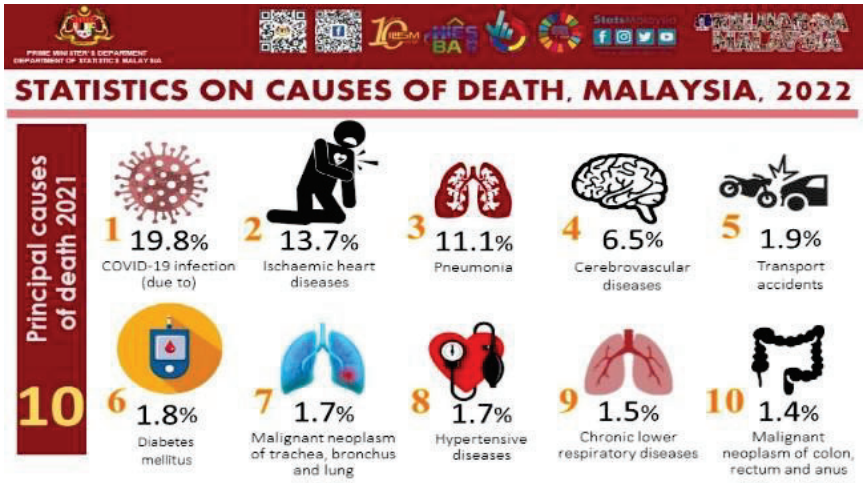

Figure 2: Statistics on Causes of Death Malaysia (Source: Department of Statistics Malaysia, 2022)

In addition, hospitalization rate due to CVD increases in Malaysia where 128 hospitals recorded mortality and morbidity cases for the past 10 years (Aniza et al., 2016). Findings by Rosengren et al. (2019) stated that middle and low-income countries show common cases of CVD rather than high income countries due to low levels of education and poorer health care. As example, India stated 261,694 fatalities in 2013 due to hypertensive heart disease with poor health care and less doctors accessible for treatment (Tiwari et al., 2022). In Malaysia, healthcare cost for non-communicable disease acquired 9.65 billion where 3.93 billion allocated for CVD which include hospitalization (1.58 billion) and drug medication (1.72 billion) (The direct health-care cost of non-communicable disease in Malaysia, 2022).

Hypercholesterolemia

Major risk factor of CVD is hypercholesterolemia (Sobey et al., 2004; Grundy et al., 2018). Hypercholesterolemia is a condition where total cholesterol exceeds its normal range in the blood serum. Consequently, around one in seven persons was diagnosed with hypercholesterolemia worldwide (Tiwari et al., 2022). Hypercholesterolemia is related to an elevated cholesterol level in the blood serum (Ibrahim et al., 2022). Excess of cholesterol can bring toxicity to the cells; however, it is an undeniable fact that cholesterol is beneficial to the body (Simons & Ikonen, 2000). Cholesterol metabolism involves several processes including dietary intake, endogenous synthesis, and excretion (Arnold & Kwiterovich, 2003; Edmondson & Bennett, 2021).

Initially, cholesterol can be obtained from diet usually animal-based foods including meat, eggs, and dairy products (Soliman, 2018). Cholesterol is the main precursor of hormones, bile salt and vitamins D which are responsible to balance body homeostasis (Luo et al., 2020; Craig et al., 2022; Patel & Kashfi, 2022). During early 2000, scientist discovered low density lipoprotein as a key regulator in cholesterol homeostasis (Vanse & Bosch, 2000). LDL were referred as the 'bad cholesterol' due to its high cholesterol content in its core (Khoury et al., 2020). HDL on the other side possess high protein than its cholesterol content which then referred as the 'good cholesterol' where its cholesterol did not deposit on artery walls and other parts of the body (Khoury et al., 2020). Usually, LDL were measured to determine CVD risk in patient as major indicator or target for CVD both in primary and secondary prevention (Carr et al., 2019). / Elevated LDL level in the bloodstream are the main factor of narrowed and harden blood vessels contribute to chest pain, heart attack and stroke (Sudha et al., 2009; Sabatine, 2018; Trinder et al., 2020).

Lipid type	General Goal	Target level	With heart or vessel disease
LDL	Lower is better	Below 130 mg/dL	Below 70 mg/dL
HDL	Higher may be better	Above 40 mg/dL	-
VLDL	Lower is better	Below 30 mg/dL	-
Triglycerides	Lower is better	Below 150 mg/dL	-

Table 1: General guide for cholesterol level (Source: Khoury et al., 2020)

To prevent atherosclerosis, a person must ensure their cholesterol level especially LDL does not exceed ideal cholesterol level (Khoury et al., 2020). Table 1 shows general guide for a normal range of cholesterol levels.

All types of cholesterol should be kept lowered except for HDL. Higher amount of HDL is better since they are proven to reduce LDL and lowered the risk of CVD through several mechanisms such as reverse cholesterol transport, anti-inflammatory and antioxidant mechanism (Cooney et al., 2009). Both LDL and HDL are comprehensively required to be monitored in determining the risk of CVD (Gao et al., 2022).

CVD prevention and treatment

To prevent risk of CVD, healthy lifestyle, monitored body weight, healthy diet with low saturated and trans-fatty acids and rich in vegetables, fruits and proteins were proposed. (Ibrahim et al., 2022).

Optimal lifestyle which can be categorized into six factors: smoking, diet, physical activity, television watching, BMI and alcohol consumption (Chomistek et al., 2015). It was found that the risk of coronary heart disease (CHD) and CVD can be reduced up to 92% and 66% respectively if they maintained all six healthy recommendations (Chomistek et al., 2015). However, support from medication is still required especially for older adults with overweight and prediabetes (Ballin & Nordstorm, 2021). As for medication, statin is the most common drugs used to treat CVD effectively (Trentman et al., 2017). Statin could effectively reduce cholesterol up to 90% but it was proven that prolonged usage of statin could give an adverse effect such as myopathy and rhabdomyolysis (Mesi et al., 2021). Ways to combat CVD were simplified in figure 3.Thus, research nowadays is looking for numerous alternatives to prevent the risk of CVD from occurring such as getting supplements from natural products and by the help of probiotics. Therefore, we need to raise us much awareness to the society on CVD as prevention is better cure.

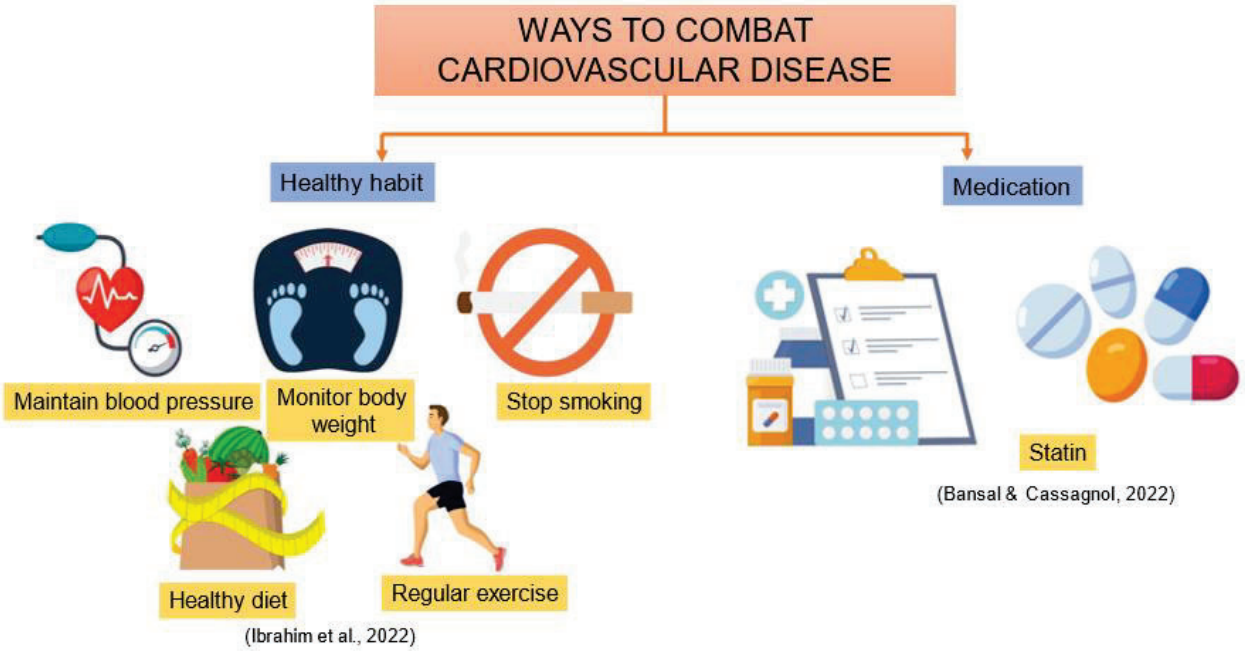

Figure 3: Common measure by health department to fight CVD (Source: National health and morbidity survey, 2019)