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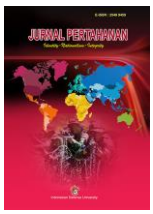

CARDIOVASCULAR DISEASE HANDLING IN MILITARY READINESS

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Abstract

Cardiovascular disease has shown a profound increase year by year which leading cause of death globally, accounts for thirty-eight million people each year for mortality with almost three-quarters of deaths occurring in lower-middle countries. In 2014 U.S. army statistics showed twice fold increase of army personnel who had cardiovascular disease, compared to 2007. This study aims to provide an overview of cardiovascular disease in Indonesian military personnel, risk factors obtained in military personnel, and preventive measures taken to reduce the progression of cardiovascular disease. It was a literature review study. The data was collected by literature with associated cardiovascular disease in military personnel, military personnel morbidities, military personnel cardiovascular factors, and preventive health in cardiovascular disease. These factors are the important point to intervene to gain more benefits that could ameliorate the progression of cardiovascular disease. Many factors that influence Military personnel include strategic factors, external and internal factors that could contribute to the health condition. Preventive health is very important to improve the health condition of military personnel considering that various deadly diseases like cardiovascular disease can be prevented through preventive health activities, so the fatal consequences and loss of life and large assets can be eliminated or at least minimized. These are various efforts to improve the implementation of preventive health development, including intensive health education socialization, military routine health check-ups as screening, military hospital big data as basis data, and military personal handbook. Programs for the implementation of preventive health development could be run with obligation from Higher Military Office.

INTRODUCTION

Cardiovascular disease has shown a large increase from year to year which is the leading cause of death globally by contributing to the deaths of 17.3 million people every year with almost three-quarters of deaths occurring in lower and middle-class countries (Figure 1 and 2) (Bennett et al., 2018; Kaptoge et al., 2019). Thereal data on cardiovascular disease in

the military population have not been fully published, there are only a few epidemiological data in general. Statistics from the UK Army show a high incidence of coronary heart disease mortality and morbidity in the military population that is not expected by the general observer (Wilson & Folkes, 2015). In 2014 statistics from the United States Army showed an incidence rate of 9.4% of military personnel suffering from cardiovascular disease, compared with 6.8% in 2007; and this is a significant improvement (American Heart Association News, 2019).

The study held by U.S. Army in 2015 has shown the active-duty component of the U.S. Army is afflicted more CVD (Cardiovascular Disease) than by any other chronic disease (United States Army, 2015). From this study, there is a true gap between the previous statistic and the recent study, which shows the increase of CVD in advancing the decades. The main etiologies for increasing CVD incidence are based on the increased cardiovascular risk factor in military personnel; this study is held by Baygi in 2020 from meta-analysis and systematic review study (Baygi et al., 2020). The identification of factors causing cardiovascular disease has 2 main aspects according to Framingham's study, namely non-modifiable factors which include age, gender, and heredity, and modifiable factors which include diabetes mellitus, hypertension, obesity, dyslipidemia, and smoking; all of these risk factors has increased globally (Roth et al., 2020). Cardiovascular risk factors can be the most important focus for interventions to obtain health benefits to minimize the progression of cardiovascular disease.

This study aims to provide an overview of cardiovascular disease in military personnel, risk factors obtained in military personnel, and preventive measures taken to reduce the progression ofcardiovascular disease. As we knew the data for cardiovascular disease in the military are scarce and the causality forcardiovascular disease has increased twice over decades in military personnel.

METHODS

The method used is a literature study. The data was collected by literature with associated cardiovascular disease in military personnel, military personnel morbidities, military personnel cardiovascular factor and preventive health in cardiovascular disease to solve the problem and make a procedure in the prevention of cardiovascular disease. The literature is gained from Google search and Google Scholar with the keyword is cardiovascular disease in military personnel. The article was from 2000-2020 with full text in pdf and from website news that is related.

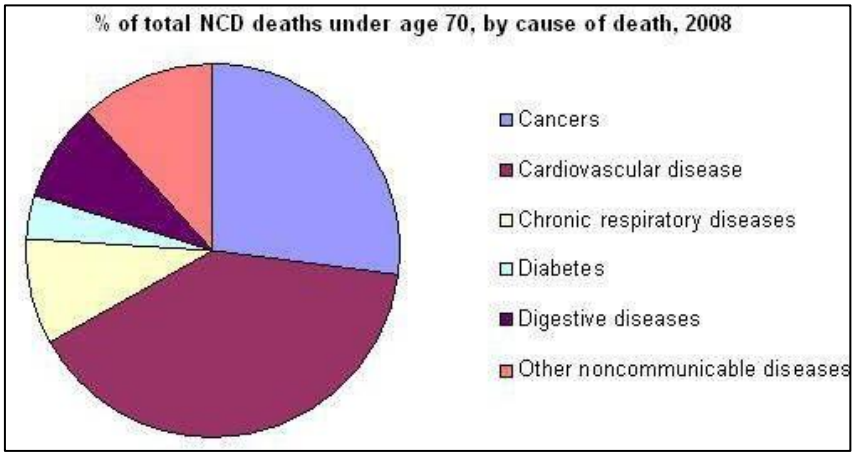

Figure 1. Deaths from Non-Communicable Diseases 2020
Source: Japan Pharmaceutical Manufacturers Association (JPMA), 2020

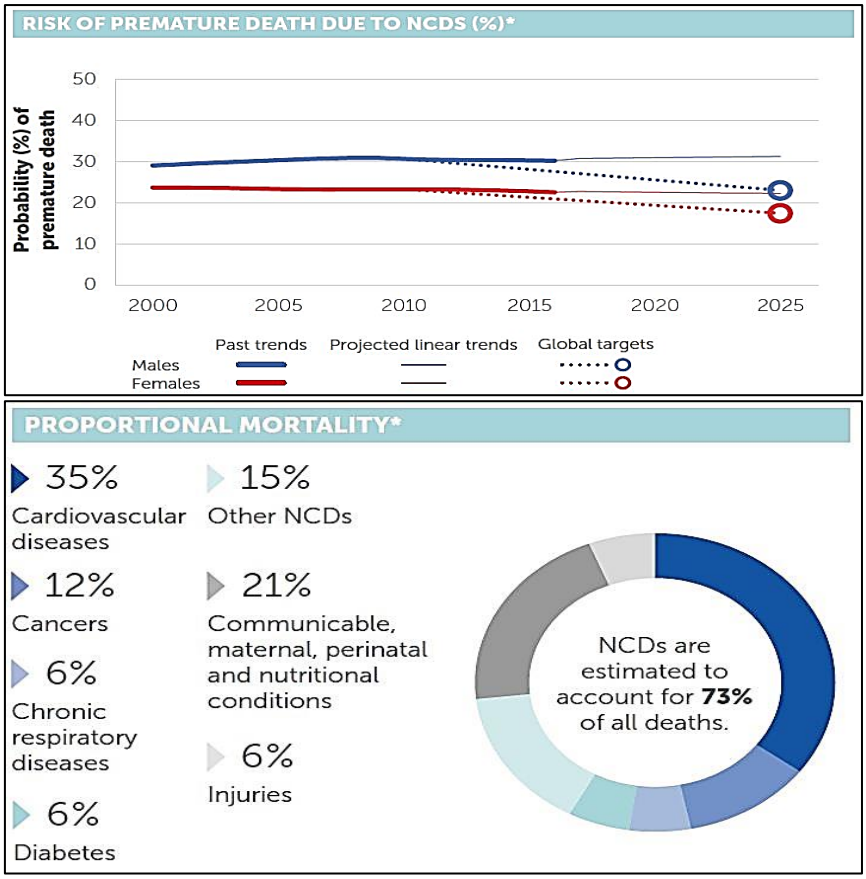

Figure 2. Health Profile of Indonesia by WHO 2018
Source: World Health Organization, 2020

RESULT AND DISCUSSION

In general, health is an important factor in the successful execution of duties for military personnel. In Law No. 23 of 1992, it is stated that what is meant by health is the welfare of self, soul, and body that allows everyone to live socially and productively (Undang-Undang No.23 Tahun 1992 Tentang Kesehatan, 1992). Soldiers arethe same as other components of the nation who need health but with certain tasks as elements of national defense so the health of soldiers must be at an optimal health condition so that they can be ready to serveat any time.

The study from AHA (American Heart Association) has shown a less ideal cardiovascular health in military personnel; this result is reinforced from another journal that emphasizes positive correlation with Framingham Risk Score (Parastouei, Sepandi, & Eskandari, 2021), from MIL-SCORE (Equalization of Accessibility to Cardiology Prophylaxis and Care for Professional Soldiers) program from Polish Army (Gielerak et al., 2020) and systematic review and meta-analysis has shown cardiovascular risk factor was estimated higher in militarypersonnel (Baygi et al., 2020). Another study from the Iran Army shown risk factors including diabetes, hyperlipidemia, smoking, hypertension, and positive family history of CAD/Coronary Artery Disease enhance the probability of CAD as much as 79.2%, 77.3%, 67.7%, 64.1%, and 56.6% respectively (Mirzaeipour, Seyedmazhari, Pishgooie, & Hazaryan, 2019). Officers tend to have higher cardiovascular risk factors than NCO/non-commissioned officers (51.6% vs 14%, respectively); this study was from Cameroon (Bell Ngan et al., 2020). Even though other journals revealed opposite results but this study has shown a lowlevel of Cardiovascular risk factors due to a more healthy lifestyle (Heydari et al.,

2010).

Health problems of soldiers can be overcome by preventive health on cardiovascular disease, which includes several things: first, reduction of cardiovascular disease in military personnel with proper handling of cardiovascular risk factors; The risk factors to be reduced are modifiable risk factors (obesity, hyperlipidemia, hypertension, diabetes mellitus, and smoking), and the second is absolute adherence to treatment if these risk factors are present. Data obtained from the United States Army show that cardiovascular risk factors have an annual incidence rate of above 10 percent (Figure 3) (Stahlman & Oetting, 2018). Other studies that reinforce the research on cardiovascular risk factors are summarized in Figure 4 (O'Donnell & Elosua, 2008). Several studies have revealed that each risk factor has a different prognostic rate for the progression of cardiovascular disease. Diabetes mellitus will increase the risk of cardiovascular disease by 2 times and the risk of a heart attack 2-4 times with the same mortality (Pennells et al., 2019). Latest research revealed 32.2% of all person with diabetes was affected by cardiovascular disease with accounting for half of the mortality over the study (Einarson, Acs, Ludwig, & Panton, 2018). Clinically there is a close relationship between diabetes and dyslipidemia where almost 97% of diabetics will have dyslipidemia, this is dueto an increase in triglycerides and a decrease in HDL (High-Density Lipoproteins) cholesterol; furthermore, diabetes is a disease of insulin that strictlyregulates both glucose and lipid metabolism via TRL (Triglyceride-Rich Lipoproteins) metabolism as the main mechanism (atherogenic axis) (Fagot-Campagna A, Rolka DB, Beckles GL, Gregg EW, 2000; Hirano, 2018). Research by Ann Marie et al revealed that a single risk factor for dyslipidemia would increase the risk of cardiovascular disease by about 4-6 times; these findings is supported by recent research from Luijten et al that revealed dyslipidemia will increase 5-6 times risk of cardiovascular disease in 15 years of follow up (Navar-Boggan et al., 2015; Luijten et al., 2019). While smoking will increase the cardiovascular risk of about 2-4 times for cardiovascular disease, it includes peripheral artery disease, coronary heart disease, and stroke; strongest effect size for the incident of peripheral artery disease which the risk due to smoking lasted up to 30 years for peripheral artery disease and 20 years for coronary heart disease (Ding et al., 2019). Another study from the Belgian Army revealed a high-risk group of active smokers is found in military personnel younger than 40 years (Mullie, Clarys, Hulens, & Vansant, 2010).

The potential mechanism for cardiovascular risk factors leading to the progression of cardiovascular disease has been revealed by many authors. The main mechanism is leading cardiovascular risk factors to inflammation and oxidative process that make endothelial dysfunction. This mechanism was first proposed by Dzau in 2004 with a cardiac continuum. The latest article from Andreas Daiber and Stefan Chlopicki shows risk factors collectively impair dependent signaling of NO/Nitrogen Oxide, inflammation, and oxidative stress, and induce endothelial dysfunction, with a central role for the loss of hemostatic balance NO, induction of oxidative stress, and low-grade inflammation (Daiber & Chlopicki, 2020) (Figure 5).

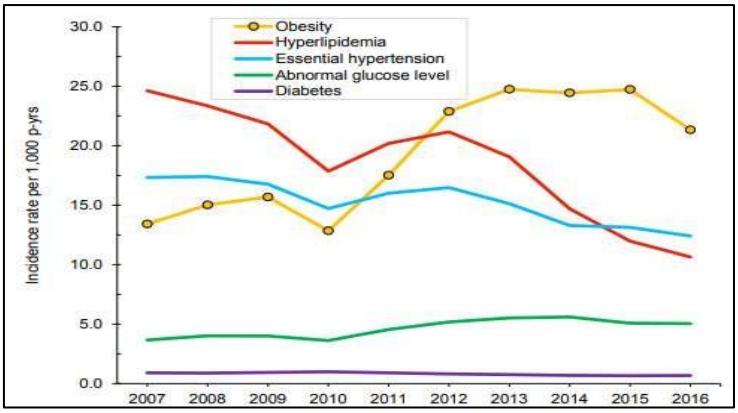

Figure 3. The annual incidence of cardiovascular risk factors in the U.S military personnel
Source: Stahlman & Oetting, 2018

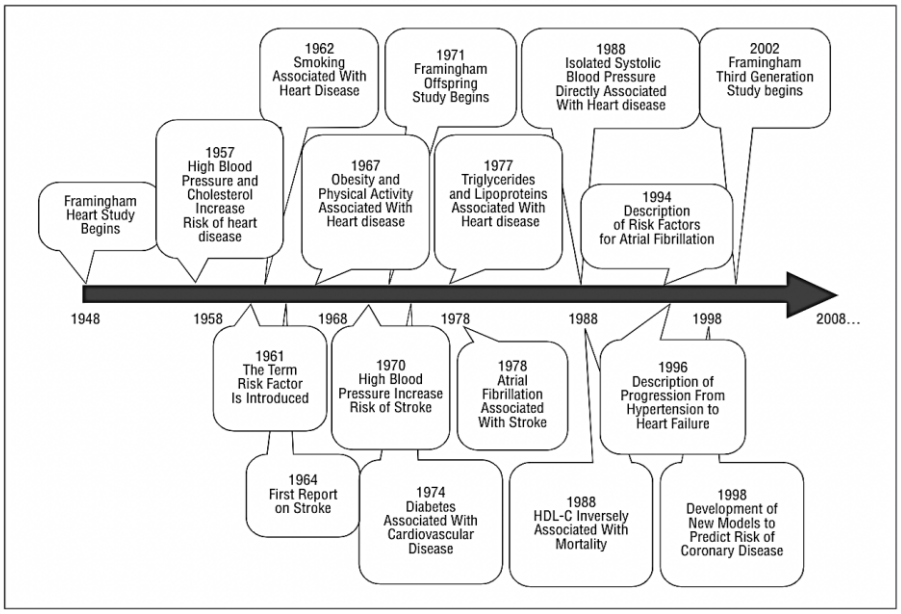

Figure 4. Findings Major cardiovascular risk factors
Source: O'Donnell & Elosua, 2008

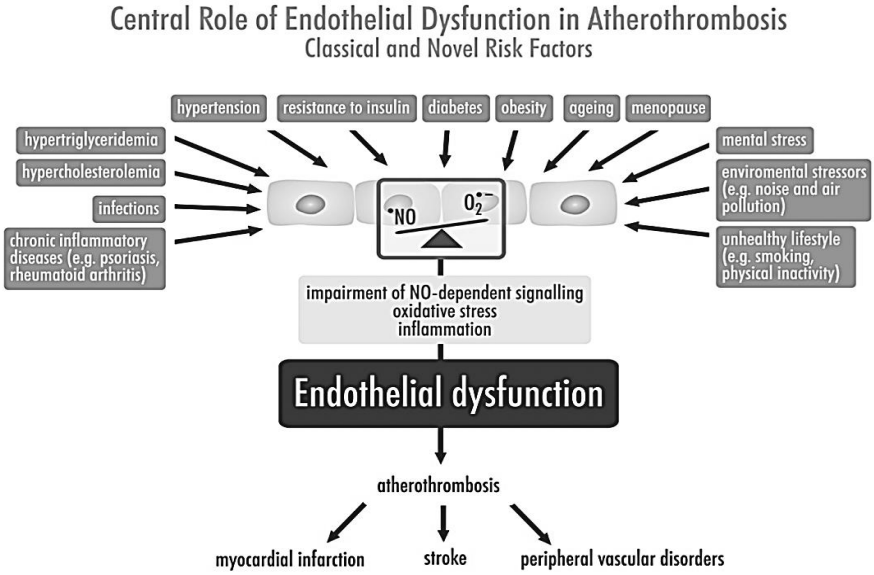

Figure 5. The central role of a cardiovascular risk factor is to induce cardiovascular disease.
Source: Daiber & Chlopicki, 2020

Table 1. SCD/Sudden Cardiac Death Incidence

	Deaths	Person-Years	SCD Inc R	IRR
Total	135	8,298,606	1.63	
Age				
<35 year	-	-	-	-
>35 year	63	6,425,421	0.63	1.00
Race	72	1,873,184	3.70	3.70
White	-	-	-	-
Black	77	5,763,967	1.34	1.00
Other	43	1,433,290	3.00	2.60
Sex	15	1,101,346	1.36	1.30
Female	-	-	-	-
Male	2	1,194,981	0.30	1.00
Service	133	7,103,646	1.87	5.28
Navy	-	-	-	-
Army	31	2,016,564	1.53	1.00
Air Force	115	3,127,742	3.68	1.60
Marines	40	2,015,818	1.98	1.13

SCD Inc R: SCD Incidence Rate, IRR: Incidence Rate Ratio
Source: Jones et al., 2015

Table 2. Cardiovascular Disease mortality etiology

	Cases n=200	Age < 35 years n=75	Age > 35 years n=125
Atherosclerotic CVD	110	12 (16%)	98(78.4%)
Idiopathic SCD with Physical Exertion	30	23(30.7%)	7(5.6%)
Anomalous Coronary Arteries	19	16(21.3%)	3(2.4%)
Cardiomegaly/Cardiomyopathy	18	12(16%)	6(4.8%)
HCM	7	4(5.3%)	3(2.4%)
Hypertensive CVD	5	2(2.7%)	3(2.4%)
Myocarditis	5	3(4%)	2(1.6%)
Valvular Disorders	3	2(2.7%)	1(0.8%)
ARVC	3	1(1.3%)	2 (1.6%)

Source: Smallman et al., 2016

Some of the incidence and prevalence of morbidity and mortality from cardiovascular disease have been well studied by the U.S. Military in Table 1.

Influential Factors

a. Environmental factor. 2 factors can affect, namely:
   1) The millennial lifestyle, especially junk food which is high in calories, high in fat, high in salt, and low in vegetables, makes a major contribution to developing unhealthy eating patterns which are the main locus for increased cardiovascular risk factors especially in advancing atherosclerotic process (Visseren et al., 2021). The recent research from GWA (genome-wide association studies) has identified triglyceride, high-density lipoprotein cholesterol, body mass index, insomnia, and alcohol dependence as causal risk factors for cardiovascular disease, mainly hypertension (van Oort, Beulens, van Ballegooijen, Grobbee, & Larsson, 2020).
   2) Abundant information through the internet can provide two conflicting sides. This can have a positive effect if military personnel can obtain valid and reliable health information or can be negative if thesource obtained is unreliable or contains hoax

information.

b. Internal and external factors.
   1) Internal factors
      a) Lack of awareness among soldiers and their families in the health.
         - Lack of understanding of good nutrition for health. There are two main sides to this, firstly, Indonesian National Army (TNI) officers do not know precisely about good nutrition or bad nutrition for health, especially heart health, or lastly, they knowbut ignore it.
         - Lack of understanding of cardiovasculardisease and risk factors for cardiovascular disease. Cardiovascular risk factors such as hypertension, dyslipidemia, smoking, diabetes mellitus, and obesity are well known or not widely known by soldiers.
         - Low attention to routine care after suffering from cardiovascular risk factors.
      b) A lifestyle that doesn't pay attention to health.
         - An unhealthy proportion of work, leisure, exercise, and good nutrition tends to exacerbate cardiovascular risk factors.
         - Consumption of fresh vegetables and fruits that are less in the daily diet.
         - Lack of stress management between tasks can make the mind heavy and a lack of recreation or relaxation can lead to a higher prevalence of cardiovascular disease.
      c) Entrust personal health problems to health agencies. Although the health of the soldiers is covered by the health unit, activeparticipation is still needed to comply with treatment.
   2) External factors
      a) Lack of prevalence and incidence data to be published to military personnel on cardiovascular disease and cardiovascular risk factors.
      b) Lack of health education in military units (needs a more interesting educational approachto avoid boredom)
      c) Lack of prevalence and incidence data to know in patients with cardiovascular disease and poorly controlled cardiovascular risk factors.

Health Strategic Steps

This step aims to improve the health status of soldiers so that they can carry out their assigned tasks optimally. This step was taken from extrapolation from several studies that emphasize and enhance the preventive approach as the first liner for combating cardiovascular risk factors. Mc Graw, et.al in 2008 has reviewed abundant of increasing cardiovascular risk factors in military active personnel in conjunction with task or war duty stressor (McGraw, Turner, Stotts, & Dracup, 2008); another study by Saffari, et.al has educational intervention based on HBM/Health Belief Model led to significant improvement in Cardiovascular risk factors (Saffari et al., 2020). So as the study previously has described the prevention step to deal with cardiovascular risk factors it means that members of the TNI unit seriously carry out cardiovasculardisease prevention activities or cardiovascular risk factors, this is noted with the emphasis from superiors in the form of supervisory orders that must be carried out by all unit members without exception which are direct supervision of the personal health aspects of a soldier.

Some methods that can be done are:

a. Intensive socialization of health education
   1) Roadshow counseling on cardiovascular disease and cardiovascular risk factors to all military units with examples of

cardiovascular death cases in the TNI and aparadigm shift that people who look healthycan have a heart attack to get a big awareness impact.

2) Combined teams of various specialists such as internal medicine, pulmonology, and nutritionists to provide awareness about cardiovascular risk factors such as diabetes mellitus, smoking, dyslipidemia, and obesity.
3) Flyers, posters, and health education videos are shown on every television in military units at the scheduled time.
4) Refreshment Course (ECG/Electrocardiography material, BCLS/Basic Cardiac Life Support, Acute Coronary Syndrome) with medical and paramedical time schedules inmilitary units.
5) Create programs such as hypertension month awareness program, arrhythmia month awareness program, etc. This program can be carried out every year, which can increase awareness among TNI personnel.

b. Military Routine Medical Check-Up *(Rikkes Har)* is a comprehensive screeningeffort.
   1) The routine examination is not only screening but as a collection of data that will provide prognostic and diagnostic parameters for cardiovascular risk factors.
   2) The Framingham Risk Score can act as an early warning and lead to better management.
   3) Treadmill stress test can be done for soldiers over 40 years old or intermediate PTP (pre-test probability) or any indicationfrom a cardiologist.
c. Military hospital health data as big data.
   1) Military medical records can be used to calculate incidence and prevalence as guidance.
   2) Military medical records can be used to create digital diagnostic cardiovascular algorithms to assist a doctor in diagnosing cardiovascular disease.
d. Military personnel health pocketbook
   1) The Handbook contains personal information on all health information for TNI personnel including illnesses, results of routine health checks, medical history, and history of consultations with doctors.
   2) The Handbook will also be transferred if TNI members move to another unit. This maintains the continuity of health guidelines and ensures medication adherence.
   3) Use of digital applications as a means of monitoring cardiovascular health functions

CONCLUSIONS, RECOMMENDATIONS, AND LIMITATIONS

Cardiovascular disease has become the number one death rate in the world and a major threat to military personnel. The incidence of cardiovascular disease increased by almost 10% in 2014. Cardiovascular risk factors (Hypertension, Diabetes Mellitus, Smoking, Obesity, and Dyslipidemia) as the main contributor to cardiovascular disease must be intervened to reduce the incidence and prevalence of cardiovascular disease. Many factors can affect the TNI apparatus, including strategic factors, external and internal factors that can contribute to health conditions.

Preventive health is very important to improve the health condition of TNI personnel considering that various deadly diseases such as cardiovascular disease can be prevented through preventive health activities so that fatal consequences and loss of life and large property can be eliminated or at least minimized. Various efforts to improve the implementation of preventive health development include the socialization ofintensive health education, routine TNI health checks as screening, big data at the TNI Hospital as a database, and

TNI's manual. This paper has limitations regarding the basis of a literature study. Further research like registry study in Indonesia Military Personnel could be a plan to gain real data.

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