

Rethinking the Relationship between Milk Drinking and Population Health Outcomes

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Abstract. Dairy products are important ingredients for healthily and balanced diet. Past research often points to a positive relationship between milk drinking and population health outcomes. However, attempts to conceptualize the relationship between milk drinking and health outcomes are inconclusive. Hence, this paper aims to aid understanding and explaining the relationship between intake of milk and dairy products with population health outcomes based on existing studies within the period of 2001 until 2024 using Cardiovascular diseases (CVD) as indicator of health outcomes. The methodology of our paper is qualitative in nature and adopts methods of library research and critical content analysis. An introduction shows that there are benefits of consuming milk on human health. The result indicates that regular intake of milk could potential lower the risk of cardiovascular diseases (CVDs) based on scientific research in several countries. With many type of milk, people need to adjust which milk that suitable and beneficial for their body based on its nutrition.

Keywords: milk, health outcomes, diseases and nutrition

Abstrak. Produk susu merupakan bahan penting untuk diet sehat dan seimbang. Penelitian terdahulu sering kali menunjukkan adanya hubungan positif antara minum susu dan dampak kesehatan masyarakat. Namun, upaya untuk mengonseptualisasikan hubungan antara minum susu dan dampak kesehatan masih belum meyakinkan. Oleh karena itu, makalah ini bertujuan untuk membantu memahami dan menjelaskan hubungan antara asupan susu dan produk susu dengan outcome kesehatan masyarakat berdasarkan penelitian yang ada dalam periode tahun 2001 hingga 2024 dengan menggunakan penyakit Kardiovaskular (CVD) sebagai indikator outcome kesehatan. Metodologi makalah kami bersifat kualitatif dan mengadopsi metode penelitian perpustakaan dan analisis konten kritis. Pendahuluan menunjukkan bahwa ada manfaat mengonsumsi susu bagi kesehatan manusia. Hasilnya menunjukkan bahwa asupan susu secara teratur berpotensi menurunkan risiko penyakit kardiovaskular (CVD) berdasarkan penelitian ilmiah di beberapa negara. Dengan banyaknya jenis susu, masyarakat perlu menyesuaikan susu mana yang cocok dan bermanfaat bagi tubuhnya berdasarkan nutrisinya.

Kata Kunci : susu, kesehatan, penyakit dan nutrisi

1. Introduction

Eating and drinking habits play a crucial role in maintaining a good health. Milk is the essential product in providing multiple essential nutrients and energy for humans. In recent years, numerous studies have reported the benefits of milk and dairy consumption. Scholz-Ahrens, et al. (2020) reported that milk contains some of the essential nutrients namely protein, fat, calcium, phosphorus, vitamin B2 and vitamin B12 that needed for human body. Moreover, cow's milk and dairy products have long been proposed to be beneficial for human health based on clinical evidence supporting direct benefit to cardiometabolic health which remain a controversy.

Past studies by Thorning, et al. (2016), Zhou, et al. (2023) and Xu, et al. (2022), stated that in traditional Western diets, milk and dairy product are the major elements such as in Nordic countries, the United Kingdom and Australia. Meanwhile, Asian countries such as South Korea, Japan and China have consumed milk and scientifically regular milk intake could lead to decrease the risk of cardiovascular diseases (Shin, et al., 2017; Wang, et al., 2020 and Tanno, et al., 2021).

As the same time, as stressed in the existing studies by Haentjens, et al. (2001), Thorning, et al. (2016), Guo, et al. (2020), Xu, et al. (2022) and Zhou, et al. (2023), they indicate that milk and dairy consumption could reduce cancer mortality, type 2 diabetes, cardiovascular diseases, bone and muscle strengths. However, there are still contradictory that milk and dairy consumption could increase the human health.

There is skepticism on the effect of dairy products in the public that claimed consuming milk could cause increase the risk of cardiovascular diseases (CVDs) due to fat content. Hence, there is increment in consumption of plant-based drink such as soy, rice, oats or almonds as alternative of cow's milk in several countries namely the United States, Sweden, Australia and Brazil. However, nutrition in plant-based drinks cannot be recommended as full alternatives to cow's milk whereas rice drinks are known to have high

content of inorganic arsenic, and soy drinks are known to contain isoflavones with oestrogen like effects (Konde, et al., 2015). Hence, cow's milk and plant-based drinks are not nutritionally comparable foods.

The current study aimed to evaluate the relationship between milk drinking and population health outcomes. Cardiovascular diseases (CVDs) is the indicator of population health outcome. As stated by WHO (2018), CVDs are the number one cause of death globally and more people died annually from CVDs than any other diseases. This review attempts to assess the scientific evidence based on past literatures and provide recommendation.

The following part consists of four section such as literature review. methodology, result and discussion and conclusion. Literature review defines past studies on the effect of consuming milk drinking and population health outcomes. Next, methodology discusses on the process of reviewing literature from library research until analysis. Result and discussion observe the relationship between milk drinking and cardiovascular diseases based on scientific work in the previous studies to answer the research objective. Lastly, conclusion and recommendation are provided.

2.Literature Review

This section aims to review the literature. It attempts to deal with issues that reveal the gaps, which still need to be closed on the relationship between milk drinking and population health outcomes. Section 2.1. traces the relevant works on the effect of consuming milk and dairy products. The concept of population health outcomes is elaborated in section 2.2. to provide information on the important thing of health outcome for human productivity and country's development.

2.1.The Effect of Consuming Milk

Milk is rich in lactose, amino acids, vitamins, minerals, essential protein and fat that benefit for a balanced diet. Milk is also an essential food source that provide nutrition and energy to human body, however past studies by Kotwal, et al., (2005), Kaplan, et al., (2003) and Llobet, et al., (2003) claimed that milk

contains heavy metals that can counter act these benefits and affect human health. For example, toxic trace element lead (Pb) and cadmium (Cd) can disturb the trace mineral composition of milk and negatively affect its nutritional quality.

Environmental pollution from industrial waste, highly urbanized area and water contamination, etc, is contributing to the global issue for men and animals due to wide range of toxic substances that enter into food supply of livestock which potentially risking human health. Concentration of heavy Pb and Cd in milk are generally higher in developing countries than developed countries. Furthermore, dairy products obtained near large urban centres or in areas that are highly industrialised or have high agricultural input technology, may contain a large number of elements that are threaten the human health namely heavy metals, dioxins and polycyclic aromatic hydrocarbons.

Milk as a liquid product tends to lose its quality rapidly unless properly treated. Milk and dairy products can be processed in number of ways during their preparation including pasteurization, sterilization and concentration. Food contamination in milk and dairy products could occurred during production, processing, packaging, storage and transport that engage many kinds of chemicals and materials. These steps may contribute some harmful effects on human health. Past studies by Girigoswami, et al. (2021), Özcan, et al. (2020) and Min, et al. (2020) reported that there are many methods of detection of food toxins and ways against food contamination and bacterial pathogens such as using nanotechnology, electrochemical biosensor, physicochemical and biological detoxification method.

~~However,~~ based on past studies conducted by Gökkaya, et al. (2023), consumers who are regular milk drinking have preference in deciding which product they bought. The key points of preferences of consuming milk are according to the brand, expiration date of the product, the amount of fat in the dairy products and price. Hence, the issue of heavy metal that may include in milk content could be avoided by pointing out the key deciding for consumers in selecting dairy products.

In terms of advantages, the intake of milk and dairy products is generally considered to promote good sleep quality and has good effect on physical and mental health (Zeng, et al., 2014; Markus, et al., 2000; and Komada, et al., 2020). The high amount of tryptophan (Try) from which melatonin is synthesized contained in milk dairy products induces sleep onset in humans. Melatonin is synthesized in vivo from Try via serotonin synthesis. The α -lactalbumin protein contained in milk has the highest Try content among the food proteins normally consumed by humans.

At the same time, nutrients supplied by milk are believed to be beneficial for bone and muscle strength. Haentjens, et al. (2001) stated that milk intake should be regularly provided in aging population because cost of treating a patients with hip fracture are about three times higher than those of caring for person without a history of hip fracture. This statement is also supported in the past work by Gökkaya, et al. (2023) where drinking milk is a basic source for maintaining a healthy metabolism and skeletal growth for all age group particulaly infant, toddler and young age. One litter milk a day meets all the calcium and phosphorus need of the adult body. It also meets the B2 and B12 vitamin needs for adults and children. Childhood growth and gain are important indicator of nutrional status, overall health and physical development. Hence, milk and diary products are considered beneficial for growing children.

Overall, consuming milk and dairy products contribute many benefits for human body including promote good sleep quality, provide good effect on physical and mental health and to strengthen the bone and muscle. Despite of negative effect of milk and dairy product, the consumer should be aware on the nutritional facts, fat content price and brand in deciding which milk to buy.

2.2.Population Health Outcomes

Population health is important in developing countries. It has a crucial role in the development process since it contributes to human capital investment and the workforce. Population health is also a primary concern for

the international community, mainly when it involves the provision of public goods.

Population health is defined as the health outcomes of a group of individuals. Population are based on geographic regions such as nations or communities and other groups such as employees, ethnic groups, disabled persons, or prisoners (Kindig & Stoddart, 2003). The study also stated that there are several determinants of health outcomes namely medical care systems, social environment, and physical environment. Similar to the view of Alderwick et al. (2018), population health outcomes are determined by lifestyle, local environment, economic factors, access to healthcare, age, and sex.

Cohen et al., (2014) described that population health allow healthcare leaders to see themselves as part of the solution and as active partners in the population health process. Healthcare leaders are the key contributors to conveying the population health agenda to the community.

The reasons why a country should pay more attention to population health are as follow:

1. Healthy people have more excellent employment opportunities that enable them to earn income
2. Healthy children that perform better in school are inherited from healthy parents.
3. Healthier individuals tend to have better care for their health and have adjust toward adverse health shocks that may ruin their income

In brief, health is a commodity where there is no market to produce it. Many factors determined population health outcomes namely social environment, good healthcare, leaders, medical care system, and family background. Thus, population health is an important element of a country's development.

Cardiovascular diseases (CVDs) is applied as proxy of population health outcomes in the current study. CVD is the name for group of disorders of the heart and blood vessels, which comprises hypertension (high blood pressure),

coronary heart disease (heart attack), cerebrovascular disease (stroke), peripheral vascular disease, heart failure, rheumatic heart disease, congenital heart disease, and cardiomyopathies. A person at risk of CVD could demonstrate high blood pressure, glucose, lipids, overweight, and obesity.

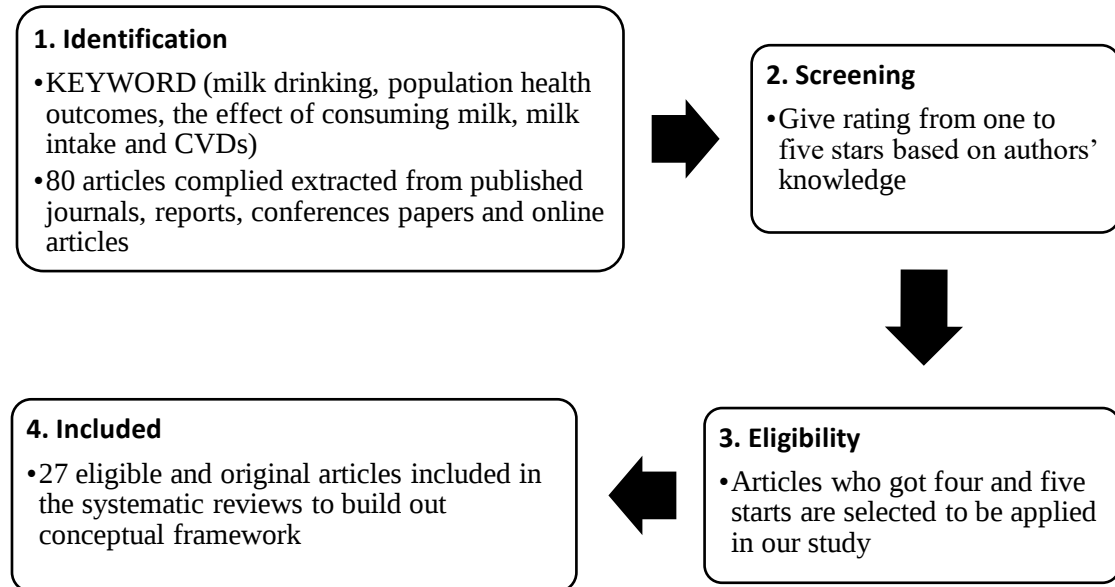
WHO (2021) reported that CVDs are the number one cause of death globally and more people died annually from CVDs than any other diseases. More than 75 % of CVD death happens in low and middle-income countries. Moreover, 85 % of CVD deaths are caused by stroke and heart attacks. Out of the 17 million premature deaths of a patient under the age of 70 who happened due to NCDs in 2015, 82% are in low- and middle-income countries, and 37% were caused by CVDs. People with CVDs or who are at high cardiovascular risk (due to the presence of one or more risk factors such as hypertension, diabetes, hyperlipidemia, or already established disease) need early detection and management using counseling and medicines, as appropriate. Most of CVDs could be prevented by changing the behavioral risk factors of the patients such as tobacco use, unhealthy diet and obesity, physical inactivity, and harmful use of alcohol.

3.Methodology

The methodology used in this research is descriptive qualitative approach with case study research type. Our qualitative studies with methods of library research and critical content analysis. Figure 1. is the flowchart of paper selection to ease our process in reviewing the literatures.

Large number of articles related to milk drinking, population health outcomes, the effect of consuming milk, milk intake and CVDs have been published within the period of 2001 until 2024 are applied as reference to obtain the research objective and to provide robust analysis. Furthermore, the process of collecting relevant articles consists of four steps. It starts with approximately 80 articles, these articles are extracted from published journals, reports, conference papers and online articles. Then we screen and sort them out to select the most relevant one and rate them. The next step is to provide rating

from one to five starts based on our knowledge. Continue with reviewing and skimming process which left us with 27 articles selected. Lastly, we choose articles related to our research objectives



Source : Author

Figure 1. Flowchart for Paper Selection

4.Results and Discussion

This chapter aims to meet the research objective. It tries to find solution to the research question outlined through scientific examination in the past studies on the relationship between milk drinking and population health outcomes.

4.1.The Relationship between Milk Drinking and Health Outcome

There are many studies examine the relationship between milk drinking and health. The benefit of milk in the human body provides energy and nutrients that considered in the existing studies. Drinking milk also has the potential to lower the risk of cardiovascular diseases, decrease the risk of obesity, reduce cancer mortality and bone protection. Past research reported that milk consumption can lower the risk of cardiovascular disease (CVD). CVD as part of Non-Communicable Diseases (NCDs) are threatening human

health and increase the number of mortalities in the world as reported by WHO (2021).

Dairy is an essential part of food culture in certain countries. For instance, in Nordic countries, they included milk and dairy products in their diets. Hence, dairy intake is the major cause of diseases free in Nordic countries namely type 2 diabetes, cardiovascular diseases and cancers (Thorning, et al., 2016)

Concurrently, milk as common diet is recommended by many guideline. Low fat, calcium rich dairy products are generally considered to lower blood pressure. Meanwhile, high-fat dairy products are known to increase high density lipoprotein (HDL) and low density lipoprotein (LDL) cholesterol concentrations. Boon, et al. (2007) stated that various nutrients from milk, such as calcium and dairy protein, may coordinated as protection against metabolic syndrome (Mets) and individual components. Calcium in milk can elevate the binding of fatty acids and bile acids in the intestine, therefore increasing fecal fat excretion and inhibiting fat reabsorption.

Several past studies found that there is significant relationship between milk intake and lowering the risk of CVD in western and asian countries such as UK (Zhou, et al., 2023), Australia (Xu, et al., 2022), South Korea (Shin, et al., 2017), China (Wang, et al., 2020) and Japan (Tanno, et al., 2021).

Recent study by Zhou, et al. (2023) indicated that from cohort study among 450,507 participants recruited in UK within the period of 2006 until 2010, it was observed that skimmed milk intake was significantly drove less cases of CVD mortality, CVD events and stroke risks. Compared to non-milk users, semi - skimmed, skimmed, and soy milk consumption; skimmed milk consumption was more beneficial to reduce all caused of mortality.

At the same time, work conducted in Australia by Xu, et al. (2022) showed that among males and female with CVD, those who often consume reduced fat milk over the long-term indicate with a 31-41% lower risk of mortality than those who often consume whole milk. The examination was

applied on linking baseline data (2006–2009) and follow-up data (2012–2015) to hospitalisation and mortality data up to 30 September 2018.

Meanwhile in Asian countries such as South Korea, China and Japan there are significant relationship between milk and dairy consumption and lower risk of CVD. The finding was based on cohort study to justify the inverse relationship between milk drinking and CVD. Firstly, Shin, et al. (2017) reported that in South Korea greater dairy consumption especially milk contributed in lowering the prevalence of metabolic syndrome (MetS). MetS is characterized by a cluster of metabolic disturbance such as abdominal obesity, insulin resistance, hyperglycaemia, dyslipidaemia, and hypertension. These elements are well-known as risk factor for type 2 diabetes mellitus and atherosclerotic cardiovascular disease. There are 130,420 participants joined the study among adult aged 40-69 year which consist of 43,682 men and 86,738 women.

Similarly, past work by Wang, et al. (2020) stated that in China moderate milk consumption drove lower risk of CVD. Concurrently, in Japan, study conducted by Tanno, et al. (2021) suggested that moderate milk consumption (7 to less than 12 cups/week) lower the risk of CVD for women. The study emphasized that people with higher milk consumption seemed to choose traditional Japanese foods such as fish and soy products accompanied by higher vegetable and fruit consumption. These foods are good to minimize the risk of mortality due to CVD. Additionally, nutrients contain in milk such as potassium, calcium and magnesium have played important role in reducing the risk of stroke. However, there is no significant relationship between milk drinking and lower risk of CVD for men due to men had high risk factor for CVD such as smoking habit, heavy drinking, diabetes and hypertension.

Overall, scientifically the relationship between milk consumption and low risk of CVD has been proven through cohort study in western and Asian countries.

5. Conclusion and Recommendation

Past literatures stated that there are benefit and drawback of consuming cow's milk. In the western countries, milk and dairy products are generally consumed as the major part in their diet. Current study aimed to review past studies on the relationship between milk drinking and population health outcomes based on scientific research in order to justify the effect of consuming milk on human health. Cardiovascular diseases (CVD) is applied in the analysis as the indicator of population health outcomes. CVD has high ranking as the cause of mortality as reported by WHO (2018).

There are large number of studies reported that milk drinking is beneficial for human body. The nutrient content in milk namely calcium, vitamin, potassium has great advantage strengthen bone and muscle, promote good sleep quality, contribute to good effect on physical and mental health, and minimize the risk of CVD.

Past works scientifically proven that there is negative relationship between milk and dairy consumption and decreasing the risk of CVD. The studies were conducted in UK, Australia, China, Japan and South Korea. Regular consumption of milk and dairy milk approximately 3 to less 12 portion a week (1 portion = 250 ml) could decrease the risk of mortality due to CVD. Therefore, the available evidence supports the intake of milk and dairy products may protect against the most prevalent chronic diseases namely CVD.

Awareness should be given for public on the good effect of milk and dairy products, particularly in Asian countries where the habit of milk just started in the beginning of the year 2000s. Through literacy at school and university, health campaign in the rural area, and milk and dairy products donation for people who are not regularly drink milk. Thus, better health outcome within a country could be achieved and eventually economic development could be increased.

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