Comparisons of Characteristics and Nutritional Inadequacies in Indonesian Older Adults Consuming or Refraining from Dairy Products

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ABSTRACT

***Background*:** *Milk consumption in the Indonesian elderly population is among the lowest in the world, and two-thirds of the population are lactose intolerant. This might have an impact on energy and nutrient intakes. However, data on the prevalence of nutrient intake inadequacies in dairy users versus non-dairy users, as well as population characteristics, are lacking. Therefore we obtained data comparing nutritional inadequacies and characteristics of Indonesian older adults consuming or refraining from dairy products.* ***Methods*:** *A cross-sectional study was conducted in 2021 as a part of the INA LACTASE study, involving 194 community-dwelling older adults in the outpatient geriatric clinic at Dr. Cipto Mangunkusumo Hospital, Jakarta, Indonesia. We collected data on demographic and clinical characteristics as part of a routinely performed comprehensive geriatric assessment. A structured questionnaire was developed to categorize participants as dairy-or non-dairy users based on habitual dairy intake. Food records were collected to assess nutrient intakes. The prevalence of inadequacies of energy, macronutrients, and a selection of micronutrients (calcium, vitamin D, and vitamin B12) was calculated by comparing the reported mean intakes to the recommended dietary intakes of the Indonesian population (Indonesian RDA). Prevalence ratios were calculated to measure the association between dairy product consumption and the prevalence of nutrient inadequacies.* ***Results*:** *We recruited 194 eligible participants. This study found that dairy users had a higher proportion of women, a higher monthly income, but a lower proportion of hypertension, diabetes mellitus, and dyslipidaemia in older adults consuming dairy products. We observed wide variability in energy and nutrient intakes, as well as a high prevalence of inadequacies for all*

dietary intake parameters, particularly micronutrients. Dairy users had a lower prevalence of micronutrient inadequacies than non-dairy users. The prevalence of vitamin D inadequacies in dairy users versus non-dairy users was 91.6% vs. 99.3% in men and 71.9% vs. 98.0% in women, respectively. Inadequate vitamin B12 intake was found in 60.6% of dairy users vs. 89.4% of non-dairy users in men and 65.5% vs.. 68.4% of women, respectively. The most pronounced difference was found in the prevalence of calcium intake inadequacies in dairy users vs. non-dairy users, which was 64.8% vs. 99.5% in men and 89.9% vs. 99.8% in women. We found statistically significant differences in the prevalence of calcium, vitamin D, and vitamin B inadequacies between dairy and non-dairy users. ***Conclusion*****:** *This study identified that dairy users had a higher monthly income and had a lower proportion of hypertension, diabetes mellitus, and dyslipidemia. In addition, we discovered a high prevalence of nutrient intakes inadequacies in Indonesian older adults, particularly among non-dairy users. Micronutrient inadequacies are major sources of concern, with statistically significant difference in calcium, vitamin D, and vitamin B12 prevalence of inadequacies.*

Keywords**:** *characteristics, nutrient intakes, the prevalence of inadequacies, older adults, Indonesia*

INTRODUCTION

Indonesia has an aging population.[1] Over the last four decades, the proportion of older adults (age 60 year or older) has increased, accounting for 9.5 percent of Indonesian population. This increase is due to improved health services, which have increased life expectancy and lower mortality rates. On the other hand, the aging population increases the demand for healthcare services, healthcare spending, and the need for socio-economic support.[1,2]

Nutrition is essential for older adults to improve their health status,[3] and nutritional status is an independent risk factor for frailty in older adults.[4] Inadequate nutrient intakes result in malnutrition, putting older adults at a high risk of developing frailty.[5] According to Setiati et al.., 25.2% of the older adults in Indonesia were frail, 61.6% were pre-frail and only 13.2% were robust.[6] Recently, some systematic reviews found that dairy products consumption lowers the risk of frailty and sarcopenia, as well as improves muscle mass. [7,8] As a result, incorporating dairy products into the daily diets of older adults could be a relevant strategy to improve health status.[7,8] Milk consumption in the Indonesian older adults, on the other hand, is among the lowest in the world,[9] and 66% of the population is lactose intolerant.[10]

Studies investigating dairy products consumption and nutrient intake inadequacies in Indonesian older adults are scarce. This study analyzed data from the Indonesian Lactose Intolerance and Dairy Products Study in the Elderly (INA LACTASE), which included data on dairy products consumption in Indonesian community-dwelling older adults. To be more specific, this study took a closer look at the characteristics and prevalence of nutrient inadequacies in dairy users versus non-dairy users. In addition with our previous publication,[10] this study presented the characteristics in a larger sample size, and used the data set to perform additional calculation analysis to determine the prevalence of nutrient intakes inadequacies. The aims of this study were to gain insight into the characteristics of Indonesian older adults consuming or refraining from dairy products and into their nutritional inadequacies**.**

METHODS

A cross-sectional study was conducted in January until August 2021 among community-dwelling older adults in the outpatient geriatric clinic, Dr. Cipto Mangunkusumo Hospital, Jakarta. The recruitment period of participants was between April to October 2019, using a consecutive sampling method. The inclusion criteria were older adults aged 60 years or older who lived in their own houses (community-dwelling). Exclusion criteria were suffering from cognitive impairment and unwillingness to participate in the study. To avoid potential bias, we used validated measures, objective data sources, and standardized interviewer's interaction with subjects.

Subjects Characteristics

Data on demographical and clinical characteristics, nutritional status, dietary intake, habitual dairy intake, were collected from all participants by trained physicians and a dietitian. A structured questionnaire was used to collect data on age, gender, level of education, monthly income, and living situation from the participants or their primary caregivers. Monthly income was classified based on the cutoff level of mean income for Indonesian older adults.[11] We assessed the functional status of participants by using the Barthel Index for Activities of Daily Living (ADL). The mini-mental state examination (MMSE) was used to assess cognitive function, and the geriatric depression scale (GDS) was used to assess psychological status as a routine assessment in the geriatric outpatient clinic. Recent cognitive function was assessed by using the Indonesian abbreviated mental test (AMT) for screening of study participants. All of the above-mentioned instruments are routinely used to conduct the comprehensive geriatric assessment by the Indonesian Ministry of Health.[12]

Nutritional Status

Weight, height, arm circumference, and calf circumference were measured to obtain anthropometric data. Body weight was measured using calibrated digital scales with a 0.1 kg accuracy. Knee height was measured in a supine position with a knee height caliper to calculate body height using the Chumlea formula validated for Indonesia.[13] Body mass index (BMI) was calculated by dividing the weight by the height squared. We also measured middle upper arm circumference (MUAC) and calf circumference (CC) as nutritional status indices based on the protocol that was utilized by Wijnhoven, et al..[14] The Indonesian version of the mini nutritional status assessment (MNA) full form was used to classify participants as well-nourished, at risk of malnutrition, or malnourished.[12]

Assessment of Dietary Intake

Current dietary intake was assessed using 3-day food records (2 weekdays and one weekend day). Nutrient intakes were calculated using Nutrisurvey software developed according to the Indonesian food composition table. The portion size was confirmed using a food model kit.[15]

Classification of Older Adults Consuming or Refraining from Dairy Products

We classified participants as consuming or refraining from dairy products based on their habitual dairy intake. Habitual dairy intake was derived from a structured questionnaire that described the amounts of milk and dairy products consumed by a person on a daily basis. Based on reported dairy product consumption, subjects were classified as dairy users or non-dairy users. Criteria for "dairy user" were: consuming at least 15 grams of milk powder (similar to 100 ml of water-dissolved milk); 100 grams of (ultra-high temperature) UHT/flavored/cultured milk or drink yoghurt; 50 grams of yoghurt; 10 grams of condensed milk or ice cream; or 5 grams of cheese on a daily basis. If the consumption of each dairy product was less than these standards, but the total consumption of all dairy products was more than 100 grams, a subject was also classified as a "dairy user".[16]

Prevalence of Nutrient Intake Inadequacies

The prevalence of inadequacies of energy and nutrient intakes were calculated based on the Indonesian RDA for the age group 60–85-year-old,[17] from which we derived 2/3 RDA as a proxy of the estimated average requirement (EAR).[18] We calculated the prevalence of inadequacy by using the following calculation: $z = (x - \mu)/SD$, with x as the dietary reference intake (2/3RDA), μ the mean nutrient intake, and SD the standard deviation of the nutrient intake. Then we calculated the percentage below the dietary reference intake based on its corresponding value in the Z-scores table.[19,20]

Sample Size

To compare the characteristics of Indonesian older adults who consume or refrain from dairy products, we included all eligible participants in the dataset, for a total data on 194 subjects. We calculated the minimum sample size required to compare the prevalence of nutritional inadequacies between two groups, using the formula to calculate differences in proportions between two independent groups. The sample

size was estimated using a level of significance of 5%, a power of 80%, a 2-sided p-value of 0.05, and a proportion difference of 30%.[21] As a result, a subset data of 103 subjects would be sufficient to achieve the desired power of this study to calculate differences of proportion in nutrient inadequacies between dairy users and non-dairy users.

Statistical Analyses

We carried out descriptive analyses for baseline characteristics (age, sex, level of education, monthly income, living situation, functional status, mental status, height, weight, BMI, MNA score, and comorbidities). We used the Kolmogorov-Smirnov test to check the normality distributions of all variables. We depicted data from normally distributed distributions as mean and standard deviation (SD), whereas data from non-normally distributed distributions was presented as median and interquartile range (IQR). Categorical data was presented as numbers and percentages. As the measure of association, we calculated the prevalence ratio of macronutrient and micronutrient inadequacies in dairy users compared with non-dairy users. Prevalence ratios (PRs) with a 95% CI not including 1.0 were considered statistically significant. Data analyses were carried out using SPSS® version 26.0.0 (IBM Corporation, Chicago, IL, USA).

Ethical Approval

This study has been approved by the Ethical Committee of the Faculty of Medicine Universitas Indonesia, with approval number KET.385/UN2.F1/ETIK/PPM.00.02/2019. Informed consents were obtained from all study participants.

RESULTS

We gathered information from 194 eligible subjects. Seventy-six of them were classified as dairy users, and 118 of them as non-dairy users. The majority of subjects had independent functional status (as measured by ADL Barthel index scores) and had current normal cognitive function (as screened by the AMT). **Table 1** presents the comparison of characteristics between dairy users and non-dairy users. According to **Table 1**, dairy users are mostly women Dairy users also had better socio-economic status, better functional status, a lower proportion of being malnourished or at risk of malnutrition, as well as lower proportions of comorbidities particularly hypertension, diabetes mellitus, and dyslipidemia.

For 103 subjects, a 3-day food intake was recorded. **Table 2** shows their mean intakes of energy, macronutrients, and selected micronutrients. While the mean daily intakes of energy, carbohydrate, and fat in dairy users compared with non-dairy users were not different, the mean daily protein intakes in dairy users compared with non-dairy users' groups were clinically different, with intakes of 67.6 (SD 15.6) g vs. 57.0 (SD 12.2) g in men and 58.4 (SD 13.7) g vs. 49.7(SD 14.3) g in women, respectively. Dairy users had higher mean calcium, vitamin D, and vitamin B12 intakes than non-dairy users. The mean daily intakes of calcium in dairy users compared with non-dairy users' groups were 603.5 (SD 283.5) mg vs. 301.1 (SD 194.8) mg in men and 476.2 mg (SD 336.1) vs. 264.8 (SD 181.2) mg in women, respectively. The mean daily intake of vitamin D in dairy users vs. non-dairy users were 6.6 µg (SD 4.7) vs. 2.5 (SD 4.3) in men and 8.3 (SD 6.5) µg vs. 1.9 (SD 5.4) µg in women, respectively. For vitamin B12, mean daily intakes in dairy users vs. non-dairy users were 2.6 (SD 6.5) µg and 1.5 (SD 1.2) µg in men and 2.9 (SD 2.7) µg vs. 1.9 (SD 2.3) µg in women, respectively.

When compared to the EAR estimates, we found wide variability in energy and nutrient intake, as well as a high prevalence of inadequacies for all dietary intake parameters. Prevalence on inadequacies for protein, calcium, vitamin D, and vitamin B12 were higher in non-dairy users than in dairy users. Prevalence of protein intake inadequacies in dairy users compared with non-dairy users were 5.7% vs. 12.5% in men and 7.8% vs. 22.4% in women, respectively. Prevalence of micronutrient inadequacies in non-dairy users was more profound compared with dairy users. Prevalence of vitamin D intake inadequacies in dairy users compared with non-dairy users groups were

Table 1. Characteristics of Dairy Users compared with Non-dairy Users in Indonesian Older Adults.

Characteristics	Total (n= 194)	Dairy Users N = 76	Non-dairy Users N = 118
Age (years), n (SD)	71.9 (5.7)	72.1 (5.3)	71.7 (5.9)
Sex			
Men, n (%)	86	29 (33.7)	57 (66.3)
Women, n (%)	108	47 (43.5)	61 (56.5)
Level of education, n (%)			
Primary school	16	5(31.3)	11(68.7)
Junior high school	13	4(30.8)	9(69.2)
Senior high school	50	22(44.0)	28(56.0)
College or higher	115	45(39.1)	70(60.9)
Monthly income, n (%)			
< IDR 1.800.000	49	14 (28.6)	35 (71.4)
≥IDR 1.800.000	145	62 (42.8)	83 (57.2)
Living situation, n (%)			
Living alone	24	13(54.2)	11(45.8)
Living with spouse	105	40(38.1)	65(61.0)
Living with children	58	21(36.2)	37(63.8)
Others	7	2(28.6)	5(71.4)
Functional status, n (%)			
Independent	138	83 (60.1)	55 (39.9)
Mild dependent	56	35 (62.5)	21 (37.5)
Mental status, n (%)			
Normal	158	62 (39.2)	96 (60.8)
Risk of depression	36	14 (38.9)	22 (61.1))
Height, cm (SD)	155.9	155.4 (6.0)	156.1 (6.3)
Weight, kg (SD)	61.7	61.1 (11.5)	62.1 (11.9)
BMI, kg/m^{2,} (SD)	25.3	25.3 (4.2)	25.4 (4.3)
MUAC, cm (SD)	28.0	28.0 (4.9)	28.0 (4.3)
MNA Score, n (%)			
Normal	175	71 (40.6)	104 (59.4)
At risk of malnutrition or malnourished	19	5 (26.3)	14 (73.7)
Comorbidities, n (%)			
Hypertension	153	55 (35.9)	98 (64.1)
Diabetes Mellitus	108	31 (28.7)	77 (71.3))
Dyslipidemia	69	25 (36.2)	44 (63.8)
Osteoarthritis	60	23 (38.3)	37 (61.7)
Neuropathy	53	18 (33.9)	35 (66.1)
Others	51	23 (45.1)	28 (54.9)

Note:
BMI= Body Mass Index, MNA= Mini Nutritional Assessment, UAC= Upper Arm Circumference

91.3% vs. 99.3% in men and 76.4% vs. 98.0% in women, respectively. Prevalence of vitamin B12 intake inadequacies in dairy users vs. non-dairy users were 43.3 % vs. 89.4% in men and 48.4% vs. 68.4% in women, respectively. The most pronounced difference was found in prevalence of calcium intake inadequacies in dairy users compared with non-dairy user's groups were 75.5% vs. 99.5% in men and 83.1% vs. 99.8% in women, respectively. In both genders, we found statistically significant prevalence ratios of micronutrients for calcium, vitamin D, and vitamin B12.

DISCUSSION

This study revealed comparisons of characteristics and nutritional inadequacies in Indonesian older adults consuming or refraining from dairy products. Dairy users included a larger proportion of women and subjects with higher monthly incomes. They were at lower risk of malnutrition and had fewer comorbidities, particularly hypertension, diabetes mellitus, and dyslipidemia. Furthermore, dairy products consumption came with lower proportions of inadequacies for protein, calcium, vitamin D, and vitamin B-12 in dairy users compared with

Table 2. The Comparison of Mean Energy-Nutrient Intakes, and Prevalence of Inadequacies between Dairy Users and non-Dairy Users in Indonesian Older Adults.

Dietary Intake	Dairy users n= 39		Non-dairy users n= 64		Prevalence ratios of Nutrient Inadequacies (95% CI)
	Intake	% Below 2/3 RDA	Intake	% Below 2/3 RDA	
Total energy (kcal), mean (SD)					
Men, n= 56	1779 (372)	5.8	1643 (288)	6.2	0.75 (0.18 - 3.19)
Women, n= 47	1478 (277)	5.5	1421 (262)	6.9	0.67 (0.12 - 3.81)
Carbohydrate (g), mean (SD)					
Men, n= 56	236.9 (64.8)	20.3	231.9 (49.0)	16.1	1.22 (0.55 - 2.72)
Women, n= 47	200.8 (39.1)	11.1	188.3 (46.3)	22.4	0.45 (0.17 - 1.21)
Protein (g), mean (SD)					
Men, n= 56	67.6 (15.6)	5.7	57.0 (12.2)	12.5	0.43 (0.12 - 1.57)
Women, n= 47	58.4 (13.7)	7.8	49.7 (14.3)	22.4	0.36 (0.12 - 1.06)
Fat (g), mean (SD)					
Men, n= 56	60.2 (23.6)	12.5	55.3 (18.3)	11.1	1.17 (0.42 - 3.25)
Women, n= 47	52.5 (14.2)	10.1	54.9 (16.9)	7.1	1.67 (0.42 - 6.64)
Calcium (mg)					
Men, n= 56	603.5 (283.2)	75.5	301.1 (194.8)	99.5	0.76 (0.65 - 0.89) *
Women, n= 47	476.2 (336.1)	83.1	264.8 (181.2)	99.8	0.85 (0.74 - 0.97) *
Vitamin D (mg)					
Men, n= 56	6.6 (4.7)	91.3	2.5 (4.3)	99.3	0.92 (0.84 - 0.99) *
Women, n= 47	8.3 (6.5)	76.4	1.9 (5.4)	98.0	0.78 (0.66 - 0.92) *
Vitamin B12(mg)					
Men, n= 56	4.1 (6.5)	43.3	1.5 (1.2)	89.4	0.48 (0.35 - 0.66) *
Women, n= 47	2.9 (2.7)	48.4	1.9 (2.3)	68.4	0.69 (0.48 - 0.99) *

*= statistically significant. EAR= estimated average requirement. Proxy of EAR based on two-thirds of the Indonesian Recommended Dietary Allowance (RDA) for age group 65-80 years old, for men and women respectively, are as follows: Energy: 1200 kcal & 1034 kcal. Carbohydrate: 183 g & 153 g. Protein: 43 g & 39 g. Fat: 33g & 30 g. Calcium: both men and women are 800 mg. Vitamin D: both men and women are 13mg. Vitamin B12: both men and women are 3 μg. The colors indicate the level of severity of inadequacies: green indicates mild inadequacies, yellow indicates moderate inadequacies, and red indicates severe inadequacies.

non-dairy users. The differences in inadequacies were more pronounced for micronutrients (calcium, vitamin D, and vitamin B12), and they were statistically significant for both genders. In addition to our previous publication from INA-LACTASE project, this study also provides a closer look at the characteristics and prevalence of nutrient inadequacies in dairy users versus non-dairy users.[10]

We classified the older adults into two groups: those who consume dairy products (dairy users) and those who refrain from dairy products (non-dairy users). It was challenging to define the "dairy user" criteria in older adults, particularly in the Asian population. We found two previous studies that quantified the amount of dairy products consumed on a regular basis. The first one is a study by Ribiero et al., who as 240 g for milk or equivalent, with an average dairy product intake of 2.6 servings/day in the adult population.[22] However, Ribiero et al. did not explicitly define dairy user criteria, and many Indonesian older adults do not meet the above-mentioned average intake of dairy products.[21] Therefore, we referred to the criteria used by Nguyen Bao et. al., in a survey on dairy products consumption and its association with nutritional status among children in the Southeast Asian countries, which is more relevant for Indonesian older adults. Because the dairy product categories were similar to the Indonesian diet, these criteria accommodate a wide range of dairy products consumed by the subjects.[16] Furthermore, we assessed the current dietary intake of the subjects using a three-day 24-hour food record, with an additional structured questionnaire to describe

the amounts of dairy products consumed by a person on a daily basis. We used 2/3*RDA as a proxy for the EAR to estimate prevalence of nutrient intakes inadequacies. This approach is considered to be more informative than RDA, which may overestimate the prevalence of inadequacies.[18,19] Almost all of Asian countries derived their recommended daily intakes or allowances (RDI or RDA) from national nutrition surveys, small scale surveys, and/or household food consumption findings, following the framework established by the Institute of Medicine's Food and Nutrition Board, which aimed to meet the requirements of 97.5 percent of healthy individuals by life stage and gender. In general, the reported mean intake values were compared to the RNI/RDA. The reported values did not include any proportions lower than the estimated average recommendation (EAR), which is now used globally. Most of the countries agreed that these recommendations should be updated. Several countries are in the process of updating their reference values.[23]

In this study, we found that dairy users included a larger proportion of women and subjects with higher monthly incomes. Historical and cultural factors heavily influence food preferences for milk and dairy products consumption. In a qualitative study, Best et al. (2013) investigated the factors associated with high-protein food consumption in older adults. Taste, texture, and odor, for example, may become more important as people age due to chemosensory losses and eating difficulties associated with tooth loss and denture use. Cost, medical constraints, and a variety of health conditions are also factors to consider.[24] Gender differences are discussed from various scientific perspectives, as well as the impact of gender on consumer behaviour. There was a distinction between men's and women's preferences. A study conducted by Ubreiová et al. in Russia and Slovakia discovered that women buy dairy products more frequently and are more concerned about the health benefits of dairy products consumption.[25] However, a qualitative study of differences in dairy products consumption, particularly between genders, is needed to be explored in the Indonesian population. A study by Lugito et al. found dairy products consumption was associated with high socio-economic status in Indonesia.[26] As a result, uthe affordability of dairy products in Indonesia has become a concern. In terms of the prevalence of nutrient intakes inadequacies, this study found that dairy users had a lower prevalence of inadequacies in protein, calcium, vitamin D, and vitamin B12 intakes. This finding is consistent with the pronounced inadequacies of nutrient intakes in general Indonesian elderly population as reported by a multicenter study by Setiati et al..[21]

We calculated the prevalence of inadequacies and found that vitamin D had the highest prevalence, followed by calcium, vitamin B12, and protein; particularly in non-dairy users. This situation may increase the risk of clinical problems associated with nutrient inadequacies in older adults, such as sarcopenia and frailty (low protein intakes),[27] osteoporosis and pathological fractures (low vitamin D and calcium intakes), cognitive impairment (low B-vitamin intakes), as well as chronic degenerative diseases (low calcium and vitamin D intakes).[28] Protein intake reference values for older adults are a topic of constant debate. Protein requirements may increase with age due to conditions such as muscle mass loss and anabolic resistance. Therefore a higher intake of protein is recommended for older adults.[29] Special attention is paid to inadequate intake of calcium and vitamin D. These nutrient deficiencies affect bone loss and can increase the risk of osteoporotic fracture. A literature review was conducted to determine the problem of calcium intake inadequacy in older adults. Data from the literature shows that calcium intake is reduced for both the elderly and people with osteoporotic fractures when global reference values are taken into account. Asians have the lowest intake of this element among the elderly. As a result, calcium supplementation should be considered in populations that are particularly vulnerable to deficiency.[30] The high prevalence of vitamin D inadequacy has been a global concern. Since dietary sources of vitamin D are limited (such as oily fish, egg yolks, and dairy products), a large proportion of the population has inadequate intakes. Most of the vitamin D source comes from skin synthesis and/or dietary

supplements.[31] Despite the fact that Indonesia is a tropical country with high sun exposure all year, genetic BsmI polymorphisms in the vitamin D receptor gene exist in the Indonesian–Malay race, which may contribute to the high prevalence of vitamin D deficiency.[32] Regarding the inadequacy of vitamin B12 intake in our population, it may be due to dietary patterns. Animal-derived foods such as meat, milk, fish, and shellfish, which are infrequently consumed in our population, are dietary sources of vitamin B12. To prevent Vitamin B12 deficiency in a high-risk population, it is necessary to identify plant-derived food sources that naturally contain a high amount of Vitamin B12.[33]

Despite these low intakes, most of our subjects were well-nourished based on MNA assessment, as the total calorie, carbohydrate and fat intake was not different between dairy users and non-dairy users group. Notwithstanding the aforementioned finding, the proportion of subjects who were at risk of malnutrition was higher in non-dairy users. Therefore, incorporating dairy products into the diets of older adults is both beneficial and well-tolerated,[10] without worrying of excessive total calorie, carbohydrate, and fat intake.

We also identified that dairy users had lower proportions of hypertension, diabetes mellitus, and dyslipidemia. These findings are consistent with a systematic review conducted by Godos et.al, who found convincing and probable evidence of reduced risks of hypertension, type-2 diabetes mellitus, metabolic syndrome and cardiovascular disease.[34] Moreover, a systematic review and meta-analysis conducted by Schwingshackl et.al found that each additional daily 200 g of dairy products was inversely associated with diabetes risk, as shown in Asian studies and subjects aged 50-years and older.[35] Aside from genetic and environmental factors, unhealthy diet and lifestyle are central to the development of CVD and a key modifiable risk factor for its prevention. Several meta-analyses conclude that, despite having a high SFA content, dairy products have a positive or neutral effect on human cardiovascular health. Recent research and meta-analyses have shown that full-fat dairy consumption has health benefits due to higher bioavailability of high-value nutrients and anti-inflammatory properties. Furthermore, full-fat dairy products contribute to higher intakes of important nutrients.[36] Besides the fat, the synergistic effects of monounsaturated fatty acids, protein components (including bioactive peptides), calcium, and antioxidant vitamins may be responsible for a number of mechanisms that benefit cardiometabolic health and reduce arterial stiffness.[37] As a result, the negative image of milk fat is fading after years of debate. As a result, consumers can continue to consume full-fat dairy products in moderation as part of a healthy and balanced lifestyle, but fermented dairy products would be preferential for optimum nutrient intake and potential cardiovascular health benefits. Thus, dairy products may be good choices of nutrient-dense food that improve nutrient intakes in older adults without increasing the risk of cardiovascular diseases due to excess total calorie, carbohydrate and fat intake.[30,31]

In addition to data on mean daily nutrient intakes, this study provides information on a lack of data reporting on the prevalence of nutrient intake deficiencies in Indonesian older adults, with a focus on dairy products consumption.[10] Our findings showed benefits of dairy products consumption in Indonesian older adults' population, particularly on micronutrients. This finding is consistent with the findings of Staveren et al., who found that dairy products contain significant amounts of protein as well as a variety of minerals and vitamins important for healthy aging. Furthermore, replacing dairy products with other foods will be difficult for the frail older adults.[38]

Moreover, the dairy user category was validated using a structured questionnaire. Thus, the dietary intake data should be reliable since it was assessed using two different instruments based on their indications. The limitation of this study was that data of food records was only available in a subset data of 103 participants. As a result, the prevalence of energy and nutrient inadequacies could only be analyzed in the subset data. However, we found that most of the characteristics of the subset data of 103 subjects were comparable to those of the 194-subject total data. The proportion of dairy users in the subset

data was almost similar to that of the participants in the total data, 38% vs. 39% respectively. As a result, the comparability of total data and subset data in our study is sufficient, and the results of the sub-group analysis might represent the total subjects.[39]

Despite the fact that our study was conducted at a single center site, we believe that our findings can be extrapolated to the general population of apparently healthy older Indonesians, taking into account comparable characteristics to a national multicenter study conducted by Setiati et al.[21] The findings of nutrient inadequacies might also be extrapolated to other populations with similar characteristics. However, our findings must be replicated under different socio-cultural conditions and/or in other countries.

Our findings show that dairy products consumption is important in supporting better intakes of protein, calcium, vitamin D, and vitamin B12 in Indonesian older adults. Dairy products might be good nutrient-dense food choices for older adults to improve nutrient intake without worrying about excess total calorie, carbohydrate, and fat intake leading to an increased risk of cardiovascular diseases. However, the affordability of dairy products might be a socioeconomic barrier. Therefore, strategies to promote affordable dairy products or other alternative nutrient- dense foods in the diets of Indonesian older adults are required.

CONCLUSION

This study identified that dairy users have higher monthly income and have lower proportions of hypertension, diabetes mellitus, and dyslipidemia; compared with non-dairy users. We also found a high prevalence of nutrient intake inadequacies in Indonesian older adults, particularly among non-dairy users. Micronutrient inadequacies are major sources of concern, with statistically significant difference in the prevalence of inadequacies for calcium, vitamin D, and vitamin B12.

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CONFLICTS OF INTEREST

None declared.

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