

Vegan Vs Non-Vegan Diet Practice and its Effect on TSH, Creatinine, bone mass levels Among Older Adults Living in Southeast Asian Countries

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Abstract

There are many cases of hypothyroidism, kidney diseases, and poor bone health among older adults in southeast Asia. This study aims to assess the role of two major diet practices that are vegan and non-vegan in response to the increase of TSH (hypothyroidism), creatinine (CKD), and decrease of bone mass due to improper calcium metabolism in the older adult population in SEA countries. A total of 95 patients were included in the study for six months in 2021, suffering from the mentioned health issues. In this descriptive cross-sectional study with a quota sampling method, the participants interested in paid virtual diet consultations were requested for filling out pre-tested open-ended questionnaires related to their dietary habits, medicines, and diagnostic tests before online platform consultations. Jamovi version 2.2.5 as the software was applied for all types of data analysis. An independent sample T was used to analyze the mean difference between dependent variables: levels of TSH, creatinine, bone mass, calcium, and two independent groups of food habits (vegan vs. non-vegan) and gender (male and female). The study found 24 vegans and 71 non-vegans out of 62 females and 33 males above 50 years of patients. Results showed no significance with any test values irrespective of gender or food habits. At the same time, while we compare effect size, the food habits group was associated with a decrease in the value of the outcome: TSH -0.2008, bone mass -0.3299, and -0.3448 (Cohen's d test). Therefore, the study can conclude that improper vegan or non-vegan diets can influence TSH, creatinine, and bone mass among older adults of both sexes in SEA regions.

Keywords: Food habits; Southeast Asian countries; Hypothyroidism; Chronic kidney diseases; Bone mass; Older adult's diet.

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INTRODUCTION

The lifestyle diseases are growing gradually in the southeast Asian countries because of improper dietary habits, absence of exercise, and poor mental health. Other factors can also accelerate the comorbidities of such patients.

Thyroid disorders old age is one of the major factors that often decrease T3 and serum thyroid-stimulating hormone (TSH), and serum-free T4 levels usually remain unchanged.

Subclinical thyroid disease, mainly subclinical hypothyroidism, should be considered one of the mandatory treatments for those older adults in any population.¹

Hypothyroidism: This health issue is one of the most prevalent thyroid diseases caused due to thyroid hormone deficiency that can be fatal if untreated in some severe cases. The most common drug recommended is levothyroxine, while the patients are usually reported with cold intolerance, obesity, lethargy, constipation, irritable bowel syndrome, hoarseness of voice, and dry skin. However, clinical manifestations can differ with sex, age, and other factors.² The euthyroid TSH level should be 0.4 -2.5 mIU/L, where T3 and T4 are normal. In subclinical hypothyroidism conditions, the TSH level is 3.0-5.5 mIU/L (T4 normal). At mild hypothyroidism, levels are usually between 5.5-10 mIU/L where T4 level decreases by 20%-30% (T3 may be expected). In moderate conditions, TSH levels should usually be within 10-20mIU/L (low T4 and T3). In the severe stage, TSH >30mIU/L, with low T4 and T3.^{3,4}

Chronic kidney diseases: In a study, it was found that 16 epidemiological studies from four SEA countries that are India, Nepal, Bangladesh, Pakistan, where eGFR was measured to assess CKD. The prevalence started at 23% in Pakistan and 11% in Nepal using the Modification of Diet in Renal Disease equation (MDRD), and the assessment of eGFR can be done through the equation = $175 \times (\text{SCr})^{-1.154} \times (\text{age})^{-0.203} \times 0.742$ (if female) $\times$. Such prevalence was higher among older adults than the normal population in other southeast Asian countries. The systematic review concluded the high prevalence of CKD in South Asian countries.⁵ Chronic kidney disease is one of the significant public health issues for southeast Asian countries because almost 2 billion people suffer from CKD.⁶ The main reason is population and poor economic status that affect entire health care costs per capita and budget of respective governments. Further, an increased serum creatinine concentration reduces sanctions in the glomerular filtration rate (GFR).⁷

Bone health: A study found that many males and females above fifty years have poor bone health. The proper preventive measures should be taken to stop the progression of osteoporosis, often caused due to low bone mass and calcium deficiency.⁸ A study showed that bone mineral density (BMD) in the SEA region is less than in Caucasians, but hip fracture rates are not something serious. Vitamin D is a fat-soluble vitamin that helps in calcium homeostasis and plays a significant role in the bones and cartilages' growth, development, and mineral

balance.⁹ However, BMD and vitamin D are highly correlated with bone mineral content (BMC), also called bone mass. Bone mass is expressed in kilogram, which is found by subtracting muscle mass from the fat-free mass. The bone mass has measured a minimum of 1.95 kg to a maximum of 2.95 kg for females, whereas males should be minimum of 2.65 kg to a maximum of 3.69 kg subject to the age group 50-75 years.¹⁰

METHODS AND MATERIALS

This is a descriptive cross-sectional study with a quota sampling method having two subgroups under the gender group, male and female. Similarly, another two sub groups under food habits were considered vegan and non-vegan. Ninety-five participants within fifty to seventy years were included from nine Southeast Asian countries, including India, based on six-month health records of diagnostics tests that are TSH, creatinine, bone mass (kg), and calcium consumption apart from dietary habits. All subjects as international patients consulted by the dietitian for online diet consultations from May to October 2021 through email systems and Google meets platform. A pre-tested open-ended questionnaire was duly filled out and subsequently received from the participants through email before the diet plan. The participants also signed the filled format and consent form following ethical norms. The critical patients admitted to the hospital or just released from the hospital at the start of the study were omitted.

The study's inclusion was exclusively based on four test parameters: TSH, creatinine, bone mass, and calcium consumption level following either vegan or non-vegan diet for long years. We applied Jamovi version 2.2.5 as software for all types of data analysis and making graphs.¹¹

RESULTS AND DISCUSSIONS

The study used parametric tests as independent sample T-test selecting groups, using gender (male and female) and food habits (vegan and non-vegan) separately with other dependent variables. The test was used to illustrate descriptive statistics of all diagnostics tests and frequencies of calcium consumption of all the selected samples among nine countries.

Some graphs were prepared to show the relevance irrespective of grouping variables to major testing factors: TSH, creatinine, bone mass (kg) level, and

Ca consumption. Table. 1 shows the mean, median, and standard deviations based upon total samples N=95. Tables 2 and 3 show descriptive statistics irrespective of food habits; 24 vegans and 71 non-vegan who were 62 females and 33 males of above 50 years of patients participated in the study.

A statistical technique for examining the mean difference between dependent variables and two independent groups is an independent sample t-test. An independent samples t-test can determine if two samples from the same population have the same mean. On the other hand, the mean may differ if samples are collected from two separate populations. It's utilized to draw inferences about two populations' means and see if they're similar in this case. As per table 4, we performed all four tests (Student's t, Bayes factor, Welch's t, Mann-Whitney U) under an independent sample T-test that found no significance with any test values irrespective of gender or food habits. At the same time, while we compare effect size, the food habits group is associated with a decrease in the value of the outcome: TSH -0.2008, bone mass -0.3299,

and -0.3448 (Cohen's d test). The values justify an opposite direction relationship between the food habits as grouping variables with the respective two variables. It simply denotes that food habits can decrease bone mass and TSH levels in a similar population in SEA countries. However, creatinine calcium consumptions are significant in terms of p values and effect size.

In the study, we also showed graphical presentation (plot-wise) within all four subgroups (gender and food habits) and lab-testing variables as concerned in the study.

Table 1: Descriptive statistics of diagnostics tests of the samples.

Results	TSH	Bone Mass	Creatinine	Calcium consumption
N	95	95	95	95
Mean	5.48	2.96	2.98	1084
Median	5.40	3.00	1.90	1000
Standard deviation	0.653	0.457	1.59	577
Minimum	4.30	2.00	1.00	500
Maximum	7.00	4.10	6.50	2000

Table 2: Descriptive statistics of all tests irrespective of food habits (both types).

Results	Food habits	N	Mean	Median	SD	SE
TSH	Vegan	24	5.39	5.30	0.580	0.1185
	Non-veg	71	5.51	5.40	0.677	0.0803
Bone Mass	Vegan	24	2.85	2.85	0.393	0.0803
	Non-veg	71	3.00	3.00	0.473	0.0561
Creatinine	Vegan	24	3.13	2.70	1.697	0.3465
	Non-veg	71	2.93	1.90	1.563	0.1855
Calcium consumption	Vegan	24	1000.00	1000.00	571.040	116.5631
	Non-veg	71	1112.68	1000.00	580.623	68.9072
Participants	Vegan	24	49.75	50.00	30.438	6.2131
	Non-veg	71	47.41	48.00	26.735	3.1729

Table 3: Descriptive statistics of all tests irrespective of gender.

Results	Group	N	Mean	Median	SD	SE
Participants	Female	62	47.85	49.00	28.337	3.5988
	Male	33	48.27	46.00	26.490	4.6113
TSH	Female	62	5.55	5.40	0.720	0.0915
	Male	33	5.35	5.30	0.486	0.0846
Bone Mass	Female	62	2.92	3.00	0.424	0.0539
	Male	33	3.04	3.00	0.510	0.0887
Creatinine	Female	62	3.05	2.80	1.630	0.2069
	Male	33	2.84	1.90	1.531	0.2665
Calcium consumption	Female	62	1145.16	1000.00	568.195	72.1608
	Male	33	969.70	1000.00	585.494	101.9214

The study mainly aims to observe the connections within four subgroups and dependent variables that are significant diagnostics tests to justify the gender wise and food habit wise relationships among the SEA populations to assess thyroid,

kidney, and bone health. However, a large sample size may depict the correct pictures of these health issues. Older adults in any country are prone to lifestyles diseases such as kidney disorders (CKD), osteoarthritis, and HT.

Table 4: Independent Samples T-Test on various tests and degree of freedom vs. effect size irrespective of food habits

	Tests	Statistic	±%	df	p	Tests	Effect Size
TSH	Student's t	-0.819		93.0	0.415	Cohen's d	-0.1935
	Bayes factor	0.325	1.06e-4				
	Welch's t	-0.884		45.8	0.381	Cohen's d	-0.2008
	Mann-Whitney U	779			0.534	Rank biserial correlation	0.0857
Bone Mass	Student's t	-1.397		93.0	0.166	Cohen's d	-0.3299
	Bayes factor	0.561	3.46e-5				
	Welch's t	-1.531		47.2	0.133	Cohen's d	-0.3448
	Mann-Whitney U	687			0.157	Rank biserial correlation	0.1937
Creatinine	Student's t	0.514		93.0	0.608	Cohen's d	0.1215
	Bayes factor	0.273	1.18e-4				
	Welch's t	0.494		37.1	0.624	Cohen's d	0.1189
	Mann-Whitney U	751			0.386	Rank biserial correlation	0.1191
Calcium consumption	Student's t	-0.825		93.0	0.411	Cohen's d	-0.1949
	Bayes factor	0.326	1.06e-4				
	Welch's t	-0.832		40.3	0.410	Cohen's d	-0.1957
	Mann-Whitney U	751			0.356	Rank biserial correlation	0.1191
Participants	Student's t	0.358		93.0	0.721	Cohen's d	0.0845
	Bayes factor	0.257	1.20e-4				
	Welch's t	0.336		35.8	0.739	Cohen's d	0.0817
	Mann-Whitney U	810			0.722	Rank biserial correlation	0.0493

In table 5, the calcium consumption was tabulated for all nine countries. It shows Cambodia (7) 500 mg, Indonesia (10) 1000 mg, and Myanmar (5)

2000 mg calcium consumptions among the total included samples in the study. The mean value is 1084 mg, while 24 vegetarians 1000 and 71 non-

Table 5: Frequencies of Calcium consumption among participants of all nine countries.

Calcium consumption	Countries	Female	Male		Calcium consumption	Countries	Female	Male
500	Indonesia	3	2	2000	Malaysia	1	0	
	Myanmar	2	0		Cambodia	4	2	
	Philippines	0	1		Vietnam	1	1	
	Singapore	0	5		India	1	1	
	Thailand	0	0		Indonesia	3	0	
	Malaysia	4	2		Myanmar	4	1	
	Cambodia	5	2		Philippines	0	0	
	Vietnam	1	4		Singapore	1	1	
	India	1	0		Thailand	1	0	
					Malaysia	2	1	
1000	Indonesia	7	3		Cambodia	3	1	
	Myanmar	6	0		Vietnam	2	2	
	Philippines	2	2		India	1	1	
	Singapore	5	0					
	Thailand	2	1					

vegetarians 1113 are mean values as shown in table for vegan and 3.0 for non-vegan population.
(2) The data India also shows bone mass mean 2.85

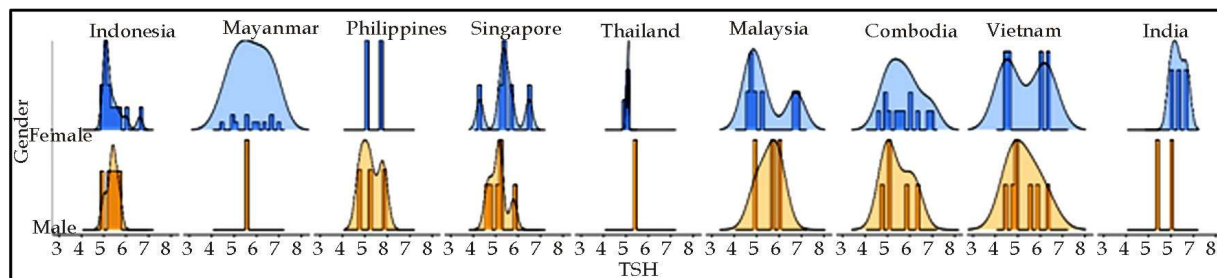


Fig.1: Gender wise TSH level observed in the 95 selected samples from nine countries.

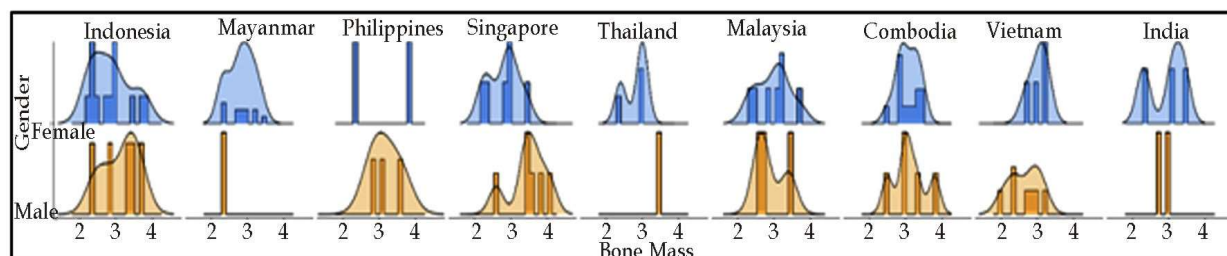


Fig. 2: Gender wise bone mass (kg) level observed in the 95 selected samples from nine countries

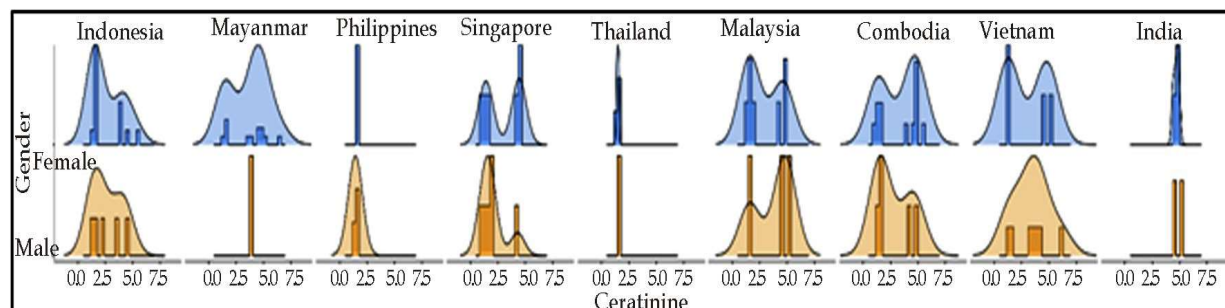


Fig. 3: Gender wise creatinine level observed in the 95 selected samples from nine countries.

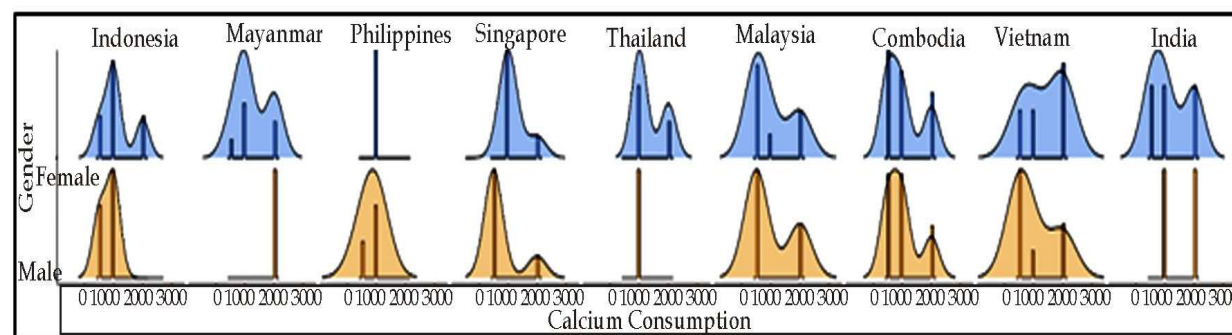


Fig. 4: Gender wise calcium consumption level observed in the 95 selected samples from nine countries

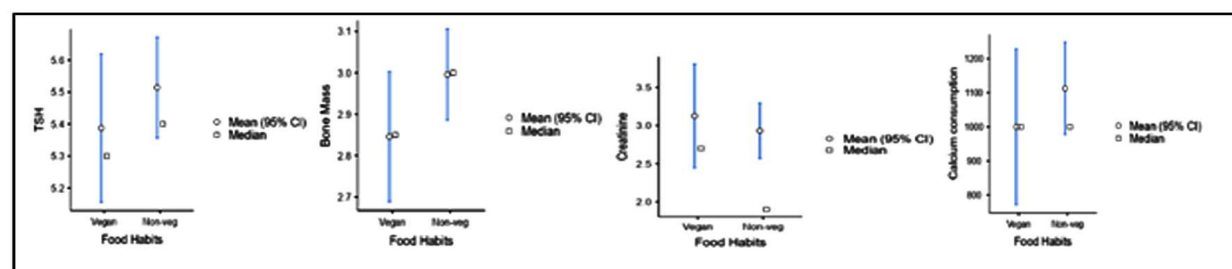


Fig. 5: Graphs of vegan vs. non-vegan habits irrespective of TSH, bone mass, creatinine, calcium consumptions

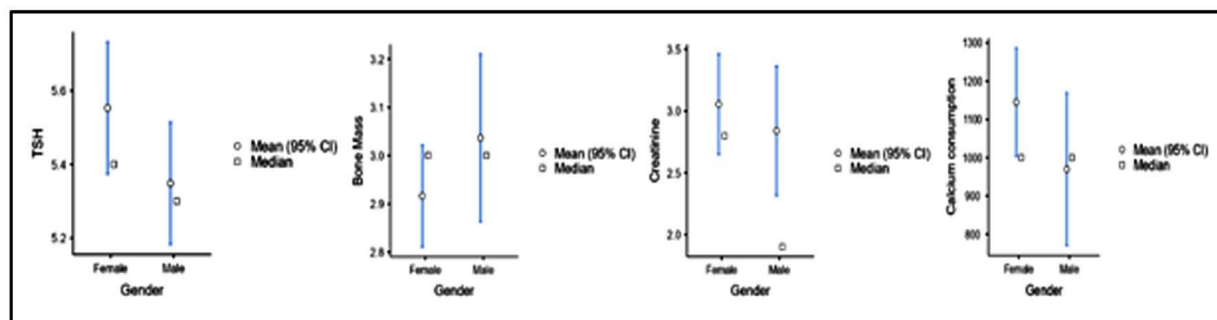


Fig. 6: Graphs of male vs. female samples irrespective of TSH, bone mass, creatinine, calcium consumptions.

Here are some graphs fig. 1-6 for pictorial presentations on the relations of significant groups and variables that are influencing the study.

CONCLUSION

Large numbers of Southeast Asian people are affected by hypothyroidism, chronic kidney disease, bone health, and other lifestyles disorders. Dietary habits and exercise practice are the major factors in such health issues. The study concludes that improper vegan or non-vegan diets can equally affect the health of male and female older adult populations. However, a proper diet can reduce the risks of diseases among SEA populations. More awareness and relevant researches are essential to understand the cause, effect and finally, the best possible solutions.

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