Factors Associated with Sarcopenia among Older Adults with Low Socio-economic Status in Kelantan

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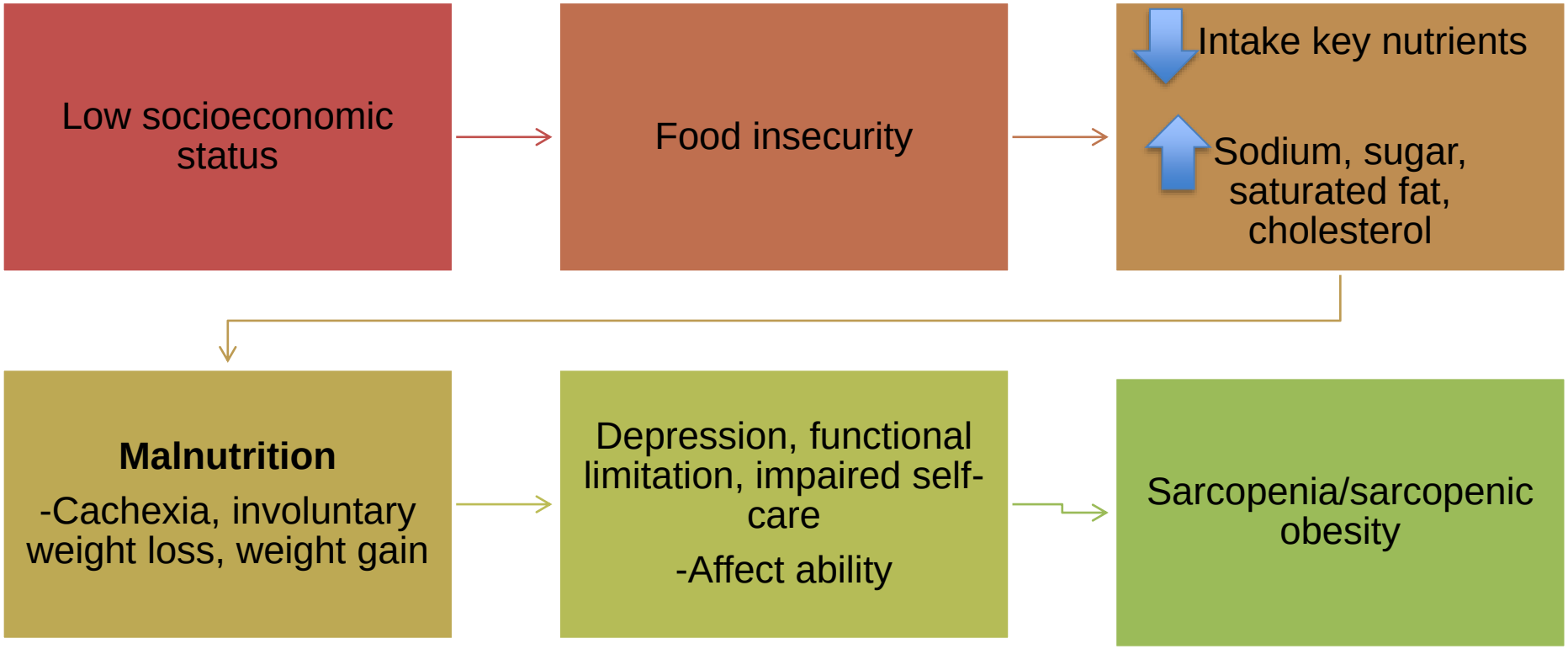
BACKGROUND

- Sarcopenia: age-related loss of muscle mass, muscle strength, physical function
  - lead to fractures, joint damage, affect organ function, and progress to cardiopulmonary failure and even death.

- Sarcopenic obesity: Sarcopenia +obesity

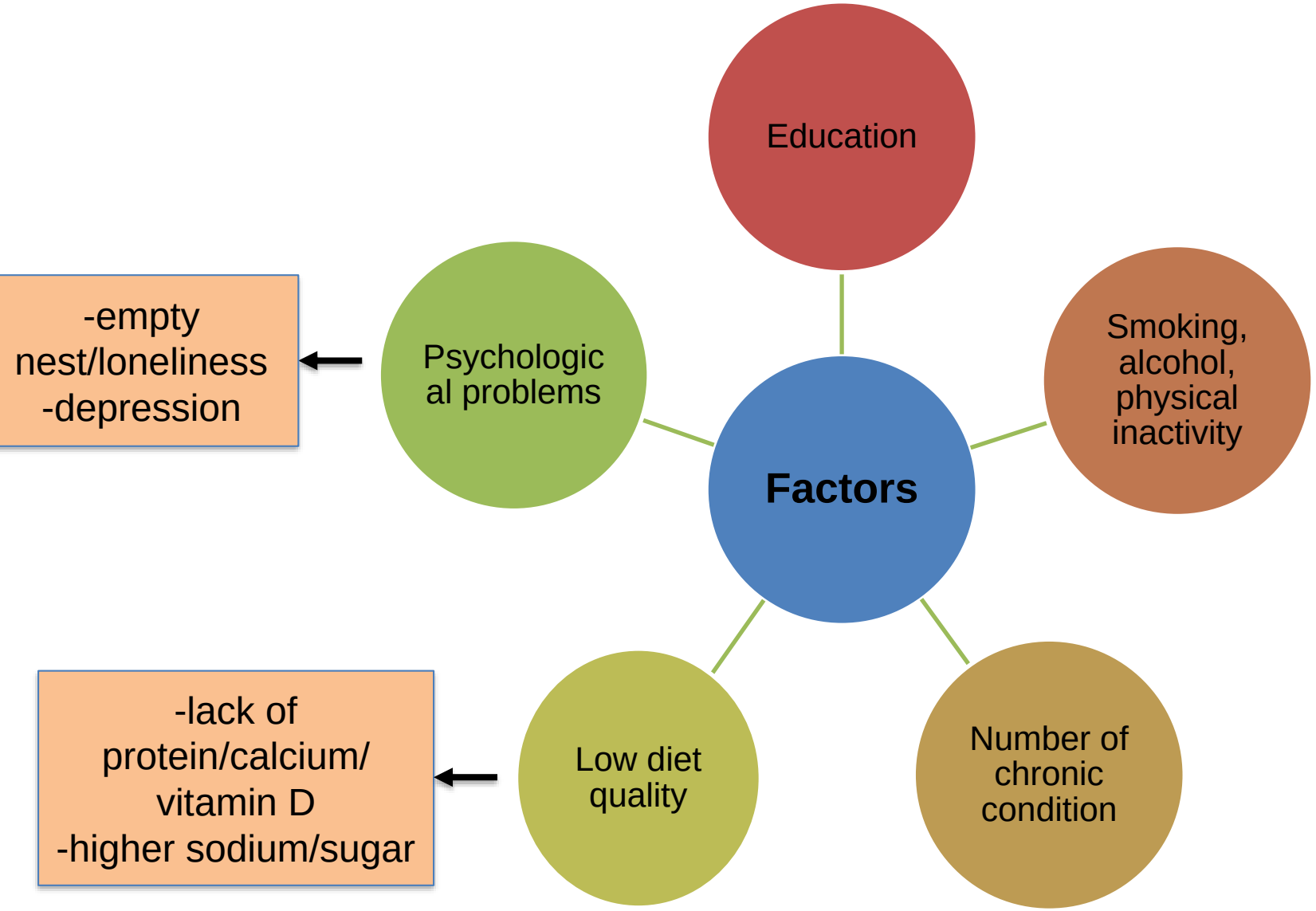
(Donini et al. 2023)

BACKGROUND



(Jung et al 2018; Sieber 2019)

Factors Related to Sarcopenia



(Yuan et al 2023; Xing et al 2022; Petermann-Rocha 2020)

STUDY OBJECTIVES

- To determine the proportion of sarcopenia and severe sarcopenia among older adults with low socio-economic status in Kelantan.

- To determine the association between anthropometry, body composition, cognitive function, social support, anorexia of ageing, and food security with sarcopenia status among older adults with low socio-economic status in Kelantan.

- To identify the factors associated with sarcopenia among older adults with low socio-economic status in Kelantan.

METHODOLOGY

Study Design & Sampling	• Cross-sectional study with convenience sampling
Population	• 293 older adults with low socio-economic status in Kelantan
Duration	• 8 months (September 2020-May 2021)

METHODOLOGY: Study Location

District	Village
Pasir Mas	Kampung Tendong, Kampung Kubang Pak Amin and Kampung Kubang Terap
Bachok	Kampung Kubang Telaga and Kampung Nipah
Tumpat	Kampung Pulau Seratus
Kota Bharu	Kampung But and Kampung Gong Dermin
Machang	Kampung Bandar and Kampung Mata Air

METHODOLOGY: Inclusion & Exclusion Criteria

Inclusion

- Older adults aged 60 years and above
- Low education level (illiterate or primary)
- B40 group (mean household income of RM3030/month) *(DOSM 2019)*
- No health problems that will limit ability to perform physical fitness tests such as on wheelchair, amputee, stroke with functional disability, neurodegenerative diseases

Exclusion

- Older adults with infectious diseases, cancer on active treatment or recurrent cancer, end stage renal failure on hemodialysis, recently undergo any major surgery, severe depressive symptoms indicated by geriatric depression scale (GDS) score of 12 and above

METHODOLOGY:STUDY PARAMETERS

Parameters	Description
Socio-demography	Age, sex, ethnicity, household income, employment status (current and past), marital status, education level, living arrangement and smoking status
Medical, Falls History and Supplement Intake	Hypertension, high cholesterol, diabetes, heart diseases, previous stroke, kidney diseases, previous cancer, lung disease, arthritis (severe joint pain), gastrointestinal diseases (diarrhea, constipation, gastroesophageal reflux disease, haemorrhoids, gastritis), urinary incontinence and other health problems that has been diagnosed by doctor.
Blood pressure	Measured using Omron Digital Blood Pressure Monitor.
Depressive Symptoms	15 item Geriatric Depression Scale (GDS-15) (*Ewe & Che Ismail 2004)* Scoring: ≥5 depressive symptoms (*Vanoh et al 2016*).
Subjective Memory Impairment	1 item: `*Do you feel that you have more problems with memory than most?*`

METHODOLOGY:STUDY PARAMETERS

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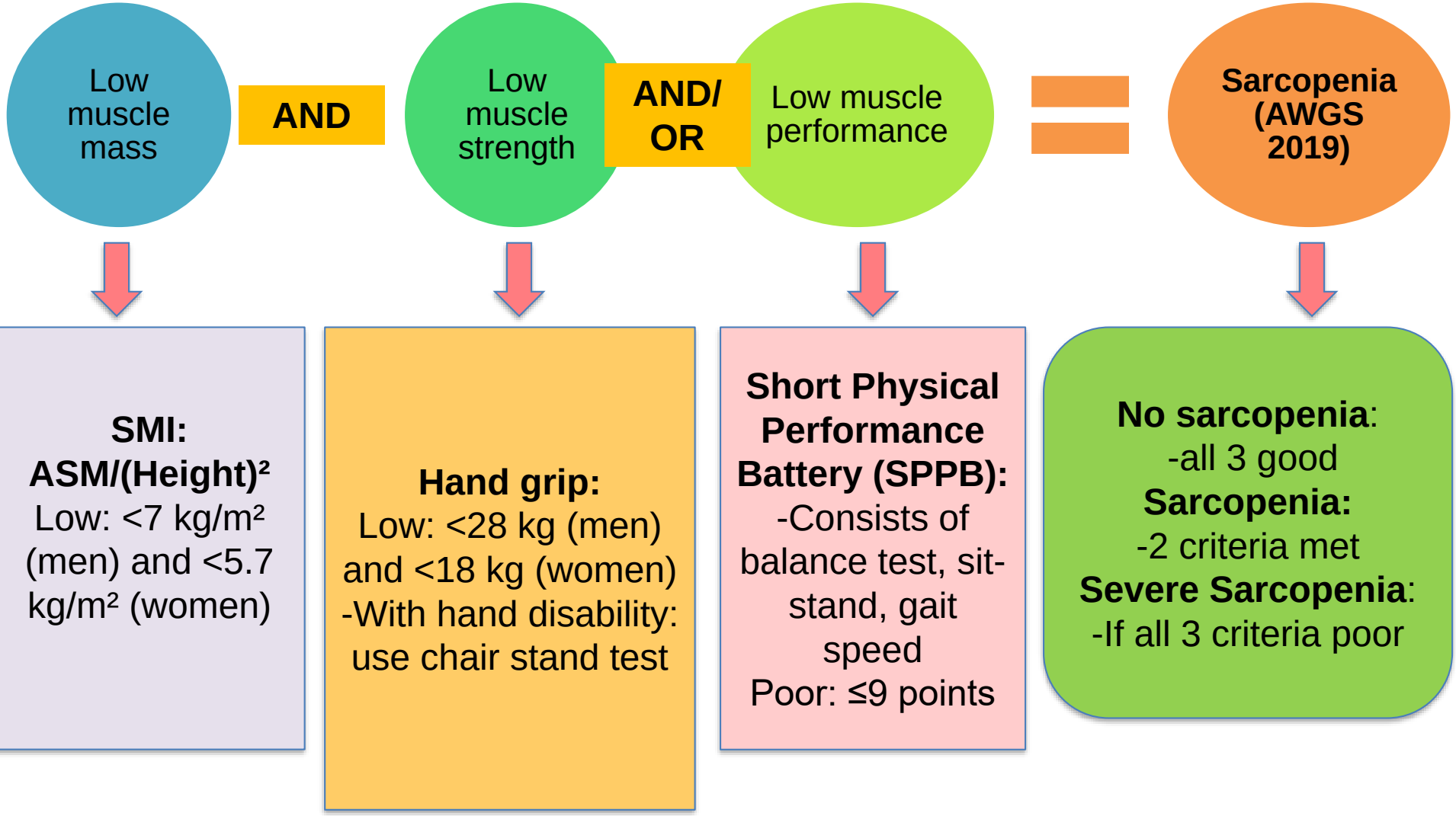
Anthropometry

- Weight, height, BMI, waist circumference, hip circumference, mid-upper arm circumference, calf circumference, arm span (if scoliosis)

Body composition

- Using bioelectrical impedance analysis (BIA)
- % body fat, % muscle mass, appendicular skeletal muscle mass (ASM)
- ASM: sum of lean mass of the upper and lower extremities

METHODOLOGY:STUDY PARAMETERS



(Chen et al 2020)

METHODOLOGY:STUDY PARAMETERS

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Cognitive

- Addenbrooke's Cognitive Examination (ACE) (Kan et al 2019)
- 5 domains: attention (18 points), memory (26 points), fluency (14 points), language (26 points), and visuospatial component (16 points)
- Scoring: ≤78 (at risk of dementia)

Social support

- Malay Lubben Social Network Scale six item (LSNS-6) (Ibrahim et al 2013)
- Two dimensions: social networks with family (first 3 items) and friends (second 3 items).
- Scoring: <12 (poor social support and social isolation).

Anorexia of ageing

- Malay Simplified Nutritional Appetite Questionnaire (SNAQ) (Hanisah et al 2012)
- 4 questions asking about 1.) appetite; 2.) satiety after food consumption; 3.) Food taste; 4.) Serving size of food consumed daily.
- Scoring: from 4-20.
- Score of 14 and below has been reported to be a predictor of malnutrition and involuntary weight loss (> 5 % within 6 months)

METHODOLOGY:STUDY PARAMETERS

Food security

- 6-item United State Department of Agriculture (USDA) Food Security Survey Module (FSSM) (Mesbah et al 2020)
- Validated among older adults in Malaysia (Cronbach-alpha:0.749)
- Food insecurity: ≥ 2

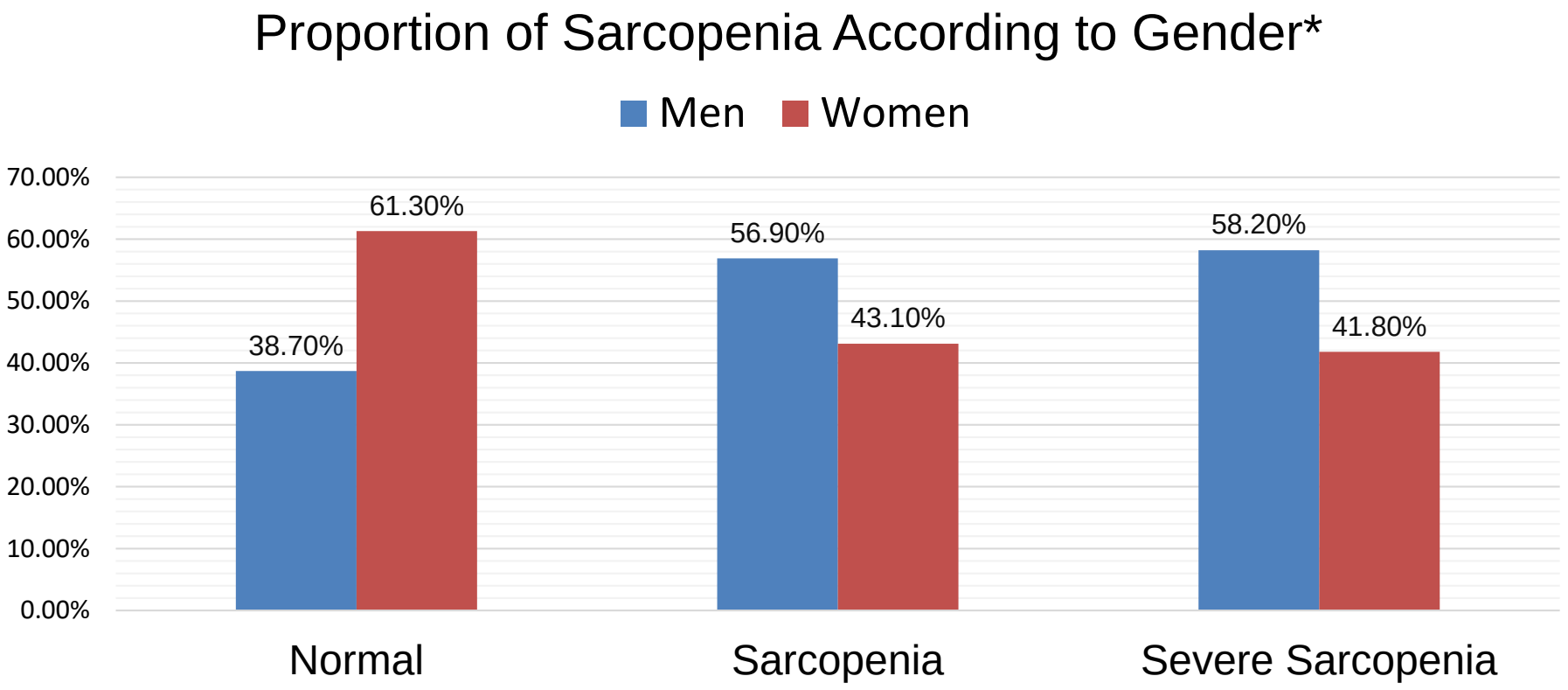
Dietary intake

- Dietary history questionnaire (habitual food intake for past 7 days)
- Use household tools (cups, plates, bowls, spoons)
- Analysed using Nutritionist Pro

METHODOLOGY: STATISTICAL ANALYSIS

Chi-Square test	• Association between categorical parameters
One-way between group ANOVA, Kruskal-Wallis Test	• Mean/median differences between categorical and numerical variables.
Binary logistic regression	• To identify predictors of sarcopenia adjusted for gender, household income, smoking

RESULTS



*Significant gender differences at p<0.05 using the Chi-Square test
Prevalence of overall sarcopenia for total population: 41%; Sarcopenia: 22.1%; Severe sarcopenia: 18.8%

RESULTS

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Table 1 Sociodemographic characteristics of study subjects based on sarcopenia status [presented as median±IQR or n(%)]

Variables	Sarcopenia Status			Total (n=293)	p-value
	Non-sarcopenia (n=173)	Sarcopenia (n=65)	Severe Sarcopenia (n=55)		
Age, years, median±IQR[a]	67.0±7.0	70.0±9.0	73.0±6.0	68.0±9.0	<0.001*
Household Income[b]					
<MYR900	89.6%	93.8%	94.5%	91.5%	0.384
RM900-RM3030	10.4%	6.2%	5.5%	8.5%	
Marital Status[b]					
Married	72.3%	66.2%	65.5%	69.6%	0.500
Unmarried/Widowed/Divorced	27.7%	33.8%	34.5%	30.4%	
Education years, median±IQR[a]	8.0±5.0	7.0±8.0	6.0±8.0	7.0±8.0	0.833
Living Status[b]					
Spouse only/alone	31.2%	30.8%	29.1%	30.7%	0.826
Spouse and children	40.7%	46.2%	40.0%	44.7%	
Children only	23.1%	23.1%	30.9%	24.6%	

[a]using Kruskal Wallis test ; [b]using Chi-Square test; *Significant at p<0.05

RESULTS

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Table 1 Sociodemographic characteristics of study subjects based on sarcopenia status [presented as n(%)]

Variables	Sarcopenia Status			Total (n=293)	p-value
	Non-sarcopenia (n=173)	Sarcopenia (n=65)	Severe Sarcopenia (n=55)		
Occupation (Current) [b]					
Government/Private/self-employed	33.5%	23.1%	21.8%	29.0%	0.122
Unemployed/Housewife	66.5%	76.9%	78.2%	71.0%	
Occupation (Previously) [b]					
Government/Private/self-employed	78.0%	67.7%	74.5%	75.1%	0.258
Unemployed	22.0%	32.3%	25.5%	24.9%	
Smoking Status[b]					
Yes	17.9%	27.7%	27.3%	21.8%	0.149
No	82.1%	72.3%	72.7%	78.2%	

[b]using Chi-Square test

RESULTS

Table 2 Anthropometric parameters based on sarcopenia status [presented as mean±SD or n(%)]

Variables	Sarcopenia Status			Total (n=293)	p-value
	Non-Sarcopenia (n-173)	Sarcopenia (n=65)	Severe Sarcopenia (n=55)		
Anthropometry					
Weight (kg), [a] mean±SD	62.0±13.1	63.3±11.5	47.6±8.8	59.6±13.4	**0.027***
Height (cm), mean±SD[a]	154.4±13.9	154.0±12.6	152.7±13.0	154.3±12.9	0.080
BMI (kg/m²)[b]					
Underweight					**p<0.001***
Normal					
Overweight					
Waist Circumferenc (cm), mean±SD[a]					**p<0.001***
Hip Circumference (cm), mean±SD[a]					**p<0.001***
Mid-upper Arm Circumference (cm), mean±SD[a]	28.0±5.3	28.0±3.4	23.5±4.3	27.0±5.4	**p<0.001***
Calf Circumference (cm), mean±SD[a]	32.3±4.3	33.1±3.1	28.8±2.7	31.9±4.1	**0.019***

Severe sarcopenia:

- Lowest weight, WC, HC, MUAC and CC
- Highest percentage of underweight (90.9%)

Sarcopenia:

- Highest number of overweight & obesity (35.4%)

[a]using One Way ANOVA ; [b]using Chi Square test

RESULTS

Table 2 Blood pressure, body composition, depressive symptoms based on sarcopenia status [presented as mean±SD or n(%)]

Variables	Sarcopenia Status			Total (n=293)	p-value
	Non-Sarcopenia (n-173)	Sarcopenia (n=65)	Severe Sarcopenia (n=55)		
Blood pressure, body composition, depressive symptoms					
Systolic (mmHg), mean±SD[a]	151.0±31.0	149.0±45.0	147.0±36.0	150.0±34.5	0.712
Diastolic (mmHg), mean±SD[a]	80.0±15.0	79.0±19.0	79.0±19.0	79.0±14.5	0.889
Muscle Mass (%),mean±SD[a]	29.0±6.6	27.5±5.6	28.1±3.5	27.2±5.6	**0.033***
Fat Mass (%),mean±SD[a]	33.0±12.2	31.3±9.7	27.4±7.1	31.1±10.4	**p<0.001***
Depressive symptoms[b] **High risk**	27.2%	30.8%	29.1%	28.3%	0.852
Subjective Memory Impairment [b] **Yes**	23.7%	27.7%	23.6%	24.6%	0.803

[a]using One Way ANOVA ; [b]using Chi Square test

RESULTS

Table 3 Medical history based on sarcopenia status [presented as n(%)]

Variables	Sarcopenia Status			Total	p-value[a]
	Non-Sarcopenia (n=173)	Sarcopenia (n=65)	Severe - Sarcopenia (n=55)	(n=293)	
Hypertension					
Yes	50.9%	61.5%	36.4%	50.5%	**0.023***
No	49.1%	38.5%	63.6%	49.5%	
Hyperlipidemia					
Yes	38.9%	36.6%	21.4%	34.6%	0.124
No	61.1%	63.4%	78.6%	65.4%	
Diabetes Mell					
Yes					0.076
No					
Cardiac Dise					
Yes					0.194
No					
Stroke					
Yes	1.2%	4.6%	1.8%	2.0%	0.242
No	98.8%	95.4%	98.2%	98.0%	
Renal Failure					
Yes	1.7%	7.7%	3.6%	3.4%	0.078
No	98.3%	92.3%	96.4%	96.6%	
Arthritis					
Yes	24.3%	18.5%	16.4%	21.5%	0.367
No	75.7%	81.5%	83.6%	78.5%	

Those with sarcopenia (61.5%) were reported to have the highest prevalence of hypertension as compared to those who were non-sarcopenic (50.9%) and severe sarcopenic (36.4%) ($p<0.05$). The remaining comorbidities were not significant between the three groups

[a]using Chi Square test

RESULTS

Table 4: Cognitive Function Domains based on Addenbrooke's Cognitive Examination (ACE) according to sarcopenia status [presented as (median ± IQR) or n(%)]

Variables	Sarcopenia Status			Total (n=293)	p-value
	Non-Sarcopenia (n=173)	Sarcopenia (n=65)	Severe Sarcopenia (n=55)		
Attention[a]	13.0±3.0	13.0±4.0	12.0±5.0	13.0±3.5	0.011*
Memory[a]	13.0±11.0	11.0±10.0	9.0±10.0	12.0±10.0	0.010*
Fluency[a]	4.0±6.0	3.0±5.0	3.0±7.0	4.0±6.0	0.046*
Language[a]	21.0±6.0	20.0±6.0	20.0±5.0	21.0±5.5	0.116
Visuospatial[a]	11.0±6.0	9.0±4.0	8.0±7.0	10.0±5.0	0.001*
Overall cognitive function[b]					
Poor Cognition	73.4%	86.2%	87.3%	78.8%	0.024*
Good Cognition	26.6%	13.7%	12.7%	21.2%	

[a]using Kruskal wallis; [b]using Chi Square test

*Significant at p<0.05

RESULTS

Table 5: Social support, anorexia of aging and food security status according to sarcopenia status [presented as n(%)]

Variables	Sarcopenia Group			Total	p-value
	Non-Sarcopenia (n=173)	Sarcopenia (n=65)	Severe sarcopenia (n=55)	(n=293)	
LSNS-6					
Social support					
Poor (<12)	49.1%	49.2%	49.1%	49.1%	1.000
Good (12-30)	50.9%	50.8%	50.9%	50.9%	
SNAQ					
Anorexia of ageing					
Poor (1-14 score)	43.4%	53.8%	56.4%	48.1%	0.140
Good (>14 score)	56.6%	46.2%	43.6%	51.9%	
FSSM					
Food security					
Good (<2 score)	67.6%	63.1%	67.3%	66.6%	0.796
Poor (2-6 score)	32.4%	36.9%	32.7%	33.4%	

Abbreviation: LSNS: Lubben Social Network Scale; SNAQ: Simplified Nutritional Appetited Questionnaire; FSSM: Food Security Survey Module

[a]using Chi-Square test

*Significant at $p<0.05$

RESULTS: Summary of Dietary Intake

- All participants in this study did not meet the RNI recommendation for all macronutrients except carbohydrate.

- Micronutrients adherence were below the RNI except sodium intake which exceeded the recommendation.

RESULTS

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Table 6: Factors Associated with Sarcopenia

Variables	B	S.E.	Sig.	Exp(B)	95% C.I for EXP (B)	
					Lower	Upper
Age	.064	.044	.144	1.066	.978	1.161
Marital Status	.492	.607	.418	1.635	.497	5.374
Hypertension	.031	.535	.954	1.031	.361	2.945
Diabetes	.773	.546	.157	2.166	.742	6.318
Weight	-.067	.039	.088	.935	.865	1.010
BMI	.039	.018	.028*	1.040	1.004	1.076
Waist Circumference	-.007	.023	.771	.993	.949	1.040
Hip Circumference	.006	.021	.788	1.006	.965	1.047
MUAC	-.083	.114	.465	.920	.736	1.150
Calf Circumference	-.040	.111	.720	.961	.773	1.194
Fat Mass Percentage	.073	.091	.422	1.076	.900	1.285
Muscle Mass Percentage	-.105	.176	.549	.900	.637	1.271
Gait Speed	.232	.123	.058	1.261	.992	1.603
GDS	-.219	.114	.056	.804	.642	1.006
Living with			.742			
Living with (1)	-.147	.638	.818	.863	.247	3.012
Living with (2)	.255	.686	.711	1.290	.336	4.949

RESULTS

Table 7: Factors Associated with Sarcopenia

Variables	B	S.E.	Sig.	Exp(B)	95% C.I for EXP (B)	
					Lower	Upper
Energy Intake	.000	.002	.918	1.000	.997	1.003
Protein	.053	.052	.309	1.054	.952	1.167
Fat	-.017	.026	.515	.984	.936	1.034
MUFA	-.315	.407	.438	.730	.329	1.620
PUFA	.021	.714	.977	1.021	.252	4.140
SFA	.216	.082	**.008***	1.241	1.058	1.457
Vitamin A	.002	.001	.254	1.002	.999	1.004
Potassium	-.003	.002	.130	.997	.994	1.001
Phosphorus	-.003	.003	.425	.997	.991	1.004
Social Support	-.446	.433	.302	.640	.274	1.494
Anorexia of ageing	.757	.468	.106	2.131	.852	5.333
Food security	.228	.465	.624	1.256	.505	3.122
Cognitive Score	-.033	.016	**.039***	.968	.938	.998
Calcium	.001	.001	.489	1.001	.998	1.004
Sodium	.000	.000	.698	1.000	.999	1.000
Magnesium	.015	.014	.269	1.015	.988	1.043
Hyperlipidemia	-.619	.523	.237	.538	.193	1.501

Model adjusted for gender, smoking, household income, education years

**Significant at p<0.05*

Abbreviation: SE: Standard error; Exp(B): adjusted odd ratio; BMI: body mass index; MUAC: mid-upper arm circumference; GDS: depressive symptoms; SFA: saturated fatty acid; MUFA: monounsaturated fatty acid; PUFA: polyunsaturated fatty acid

DISCUSSION: Prevalence of Sarocpenia

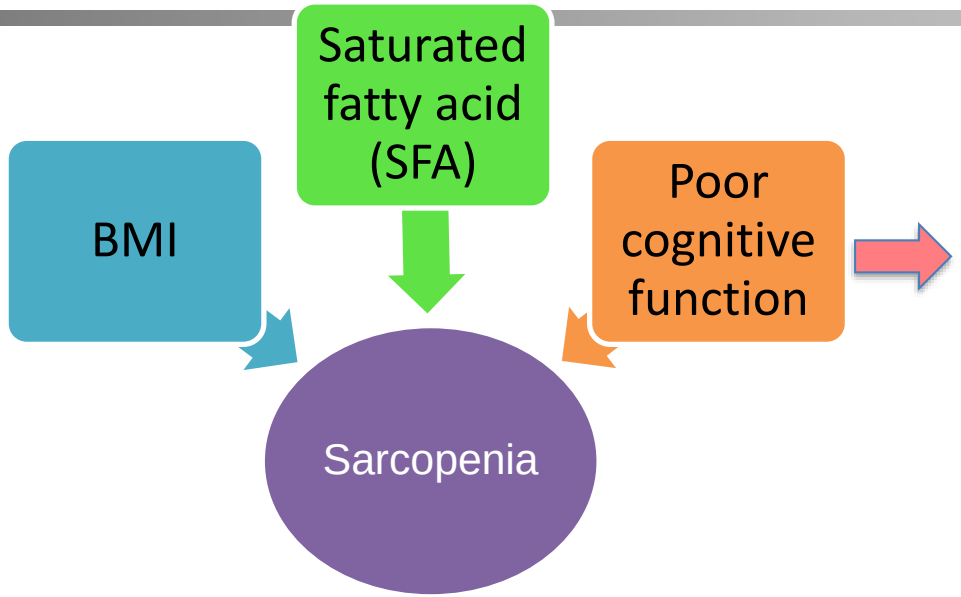
Total sarcopenia prevalence: 41%
-Sarcopenia (56.9%) & severe sarcopenia (41.8%) higher among men
-Severe sarcopenia: lowest body circumference, fat mass, skeletal muscle index, grip strength, poor physical performance, lowest cognitive function

230 Chinese older people in Kota Bahru
-Sarcopenia: 12.6% (AWGS 2019), no significant gender differences
-Women had lower muscle mass, handgrip strength
(*Foo et al 2023*)

In Klang Valley,
-Sarcopenia: 33.6% (overall), 30.1% (men), 35.9% (women) (Ranee et al 2022)
-Elderly with T2DM with sarcopenia: 28.5%
(Sazlina et al 2020)

Cohort study in Negeri Sembilan (Ramoo et al 2022)
-Sarcopenia: 5.0%; Severe sarcopenia: 3.6%
-Men higher sarcopenia (8.5%) & severe sarcopenia (5.7%)

DISCUSSION: Cognitive function & Sarcopenia



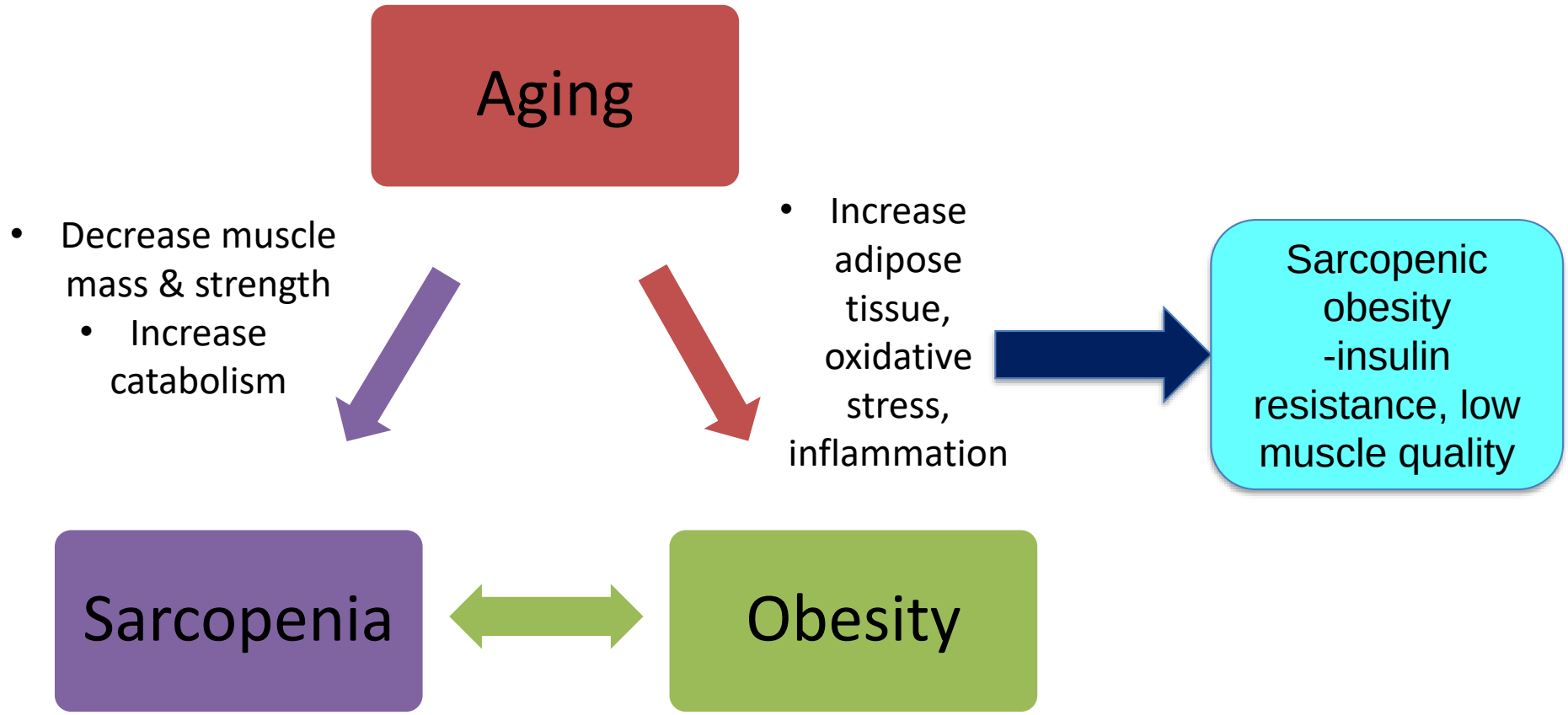
Cognitive impairment limits physical activity, frequent falls, inadequate dietary intake
-lead to muscle loss

Age-related chronic low-grade inflammation
-elevate interleukin-6 & tumour necrosis factor-α

Changes in neuronal function, muscle synergy formation impairment, basal ganglia weakness
-muscle weakness, lower gait speed

(Du et al 2023; Ramoo et al 2022)

Discussion: BMI and Sarcopenia



(Lutski et al 2020; Ryu et al 2020)

Discussion: SFA and Sarcopenia

Low SES-increase intake of food high in fat, processed meat-Food insecurity reflects financial hardship which affects food purchase and eating patterns

SFA reduces muscle cell size, suppression in insulin signalling, increased expression of pro-atrophic genes

Downregulate activity of key nutrient transporters-impair amino acid uptake, muscle mass loss

Montiel-Rojas et al 2020

CONCLUSION

Overall prevalence of sarcopenia: 41.0%

Univariate analysis:

-Severe sarcopenia: Greater age, higher proportion of underweight & poor cognition, lowest weight & body circumference

-Sarcopenia: highest proportion of hypertension & overweight as compared to normal and severe sarcopenia

Multivariate analysis: The factors associated with sarcopenia among low SES older adults: increasing BMI, higher intake of saturated fatty acid & poor cognitive function

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THANK YOU