

**Adult NZ Chinese
Comparative Study of Body Composition
Measured by DEXA**

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ATTESTATION OF AUTHORSHIP

“I hereby declare that this submission is my own work and that, to the best of my knowledge and belief, it contains no material previously published or written by another person (except where explicitly defined in the acknowledgements), nor material which to a substantial extent has been submitted for the award of any other degree or diploma of a university or other research institution of higher learning”.

Signed.....

Date.....

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ABSTRACT

Body fat, regional body fat and bone mineral mass, are linked to health conditions such as obesity and osteoporosis. The ethnic comparison of body composition may help to explain and understand the difference of health outcomes and health status in different ethnic groups. NZ Chinese is the largest Asian group in New Zealand, however, knowledge about health risks and body composition for NZ Chinese is very limited. Therefore, the aims of this thesis were: 1) To compare the relationships between body mass index (BMI) and percentage body fat (%BF) of European (M29, F37), Maori (M23, F23), Pacific people (M15, F23), and Asian Indian (M29, F25) (existing data) with NZ Chinese aged 30-39 years; 2) To compare fat distribution, appendicular skeletal muscle mass (ApSM), bone mineral density (BMD) and limb bone lengths across these five ethnic groups.

A convenience sample of healthy NZ Chinese (M20, F23) was selected by BMI to cover a wide range of body fatness. Total and regional body fat, fat free mass (FFM) and bone mineral content were measured by whole-body Dual-energy X-ray absorptiometry (DEXA). The main study findings were:

- For a fixed BMI, NZ Chinese had a higher %BF than European and less %BF than Asian Indian. At a %BF equivalent to a BMI of 30 kg.m⁻² in Europeans (WHO threshold for obesity), BMI values for Asian Indian and NZ Chinese women were 5.8 and 2.2 BMI units lower than European, respectively, and for Asian Indian and NZ Chinese men, 8.2 and 3.0 BMI units lower.
- Abdominal-to-thigh fat ratio of NZ Chinese was significantly higher than that of European (P<0.001) and similar to that of Asian Indian. NZ Chinese had a significantly higher central-to-appendicular fat ratio than both Asian Indian and European (P<0.001). NZ Chinese was centrally fatter than European and Asian Indian.
- For the same height and weight, NZ Chinese had significantly less FFM (-2.1 kg, P=0.039) and ApSM (-1.4kg, P=0.007) than European. NZ Chinese had significantly more FFM (+3.2 kg, P=0.001) than Asian Indian and similar ApSM to Asian Indian.
- For the same weight, NZ Chinese had a similar BMD as European for female and male. NZ Chinese male had a higher BMD (+0.07 g.cm⁻², P= 0.001) than Asian Indian male.

- Among the five ethnic groups, NZ Chinese had the shortest leg (-1.5cm, P=0.016) and arm bone lengths (-2.3cm, P=0.001) (measured by DEXA) for the same DEXA height.

Therefore, the relationship between percent body fat and BMI for Asian Indian and NZ Chinese differs from Europeans and from each other, which indicates that different BMI thresholds for obesity may be required for these Asian ethnic groups. Given the relatively high percentage body fat, low appendicular skeletal muscle mass and high central fat to appendicular fat ratio of NZ Chinese aged 30-39 years demonstrated in this study, promotion of healthy eating and physical activity is needed to be tailored for NZ Chinese. The NZ Chinese community should be advised to keep fit, prevent limited movements in older age, and to prevent obesity and obesity-related diseases.

ABBREVIATIONS

%BF	Percentage body fat
A/T ratio	Abdominal-to-thigh fat ratio
AF	Abdominal fat
ApSM	Appendicular skeletal muscle mass
BIA	Bioelectrical impedance analysis
BMC	Bone mineral content
BMD	Bone mineral density
BMI	Body mass index
C/Ap ratio	Central-to-appendicular fat ratio
CI	Confidence intervals
CT	Computer assisted tomography
CVD	Cardiovascular disease
DEXA	Dual-energy X-ray absorptiometry
ESC	Extracellular solids
ECF	Extracellular fluid
FM	Fat mass
FMI	Fat mass index
FFM	Fat free mass
GLU	Fasting glucose
HC	Hip circumference
HDL	High density lipoprotein
INS	Fasting insulin
L/H	Leg length to height ratio
LDL	Low density lipoprotein
LM	Lean mass
MAR	Mass of abdominal region
MRI	Magnetic resonance imaging
MUAC	Mid upper arm circumference
PA	Physical activity
NZ	New Zealand
SAD	Sagittal abdominal diameter
SAT	Subcutaneous adipose tissue
SCD	Sagittal chest diameter

SD	Standard deviation
SE	Standard error
SEE	Standard error of estimate
SH/H	Sitting height/Height
STM	Soft tissue mass
TBF	Total body fat
TBW	Total body water
TC	Total cholesterol
TF	Thigh fat
TG	Total triglycerides
VAT	Visceral adipose tissue
WC	Waist circumference
WHO	World Health Organization
WHR	Waist to hip ratio

GLOSSARY

There are a number of ethnic categories used in this thesis as well as other studies/reports discussed. To avoid any confusion, this glossary section is for clarifying ethnic categories used in the results section of this thesis and in major reports from the New Zealand health sectors. The ethnic categories used in other referenced studies and reports will be explained in the content.

Asian: An ethnic category for people with origins in the Asian continent from Afghanistan in the west to Japan in the east, and from China in the north to Indonesia in the South. Asian is divided into three subgroups in Asian health Chart Book 2006: Chinese, Indian and Other Asian. The other Asian group includes Koreans, Japanese, Vietnamese, Filipinos, Bangladeshis, Pakistanis and Afghans.

Asian Indian: An ethnic category for people with origins in the Indian subcontinent. It includes Sri Lankan and Fijian Indian.

Maori: A tribal people of Polynesian origin indigenous to New Zealand.

Pacific People: People of Polynesian origin but not Maori.

New Zealand Chinese: An ethnic category for people normally living in New Zealand with origins in China.

South Asian: An ethnic category that includes people with origins in India, Sri Lankan, Bangladesh and Pakistan. Fijian Indians are included in this category as their country of ancestral origin is India.