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Gender difference in body mass index in West New Britain Province, Papua New Guinea: A sub-analysis of a cross-sectional questionnaire study

Short title: Gender difference in BMI in PNG

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Authorship

T.S. designed the study, collected, and analysed the data, interpreted the results, and prepared the manuscript. N. M. and K. I. supervised data analysis and manuscript preparation. All authors take responsibility for all aspects of the reliability and freedom from bias of the data presented and their discussed interpretation. All authors have approved the final article.

Declaration of Conflicting Interests

The authors declare that they have no conflicts of interest.

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Obesity, or high body mass index (BMI) is a global public health concern because the links between obesity, poor health outcomes, and all-cause mortality are well established.¹ According to the World Health Organization, the incidence of obesity varies greatly by gender, country and economic status, and overall, more women are likely to be obese than men.¹ This difference implies the need for gender-specific or -tailored strategies in this health issue.²

Papua New Guinea (PNG) is a Pacific Island country seriously involved in the obesity issue. According to previous studies, the percentages of overweight or obese people in PNG range from approximately 30 to 40%.³ However, detailed gender-stratified analysis of BMI was not conducted in these previous studies, and little is known about gender difference in BMI among people in PNG. This study was a sub-analysis of our previous questionnaire-based cross-sectional study⁴ that investigated the awareness of personal height and weight among people in West New Britain Province (WNB), PNG.

Briefly, the previous study included a convenient sample of 558 community-dwelling healthy children and adults (mean age 34.8 ± 14.0 years, 48.2% women, average BMI 25.1 ± 4.8 kg/m²) and collected demographic, anthropometric, and awareness-related data. Details of the study setting and participants are in our previous report.⁴

In this study, we extracted the demographic and anthropometric data from our previous study⁴ to clarify gender-related differences in BMI, which was calculated by dividing weight by height squared. For analytical purposes, these values were divided into the following groups by age (≤ 29 [young], 30–49 [middle], and ≥ 50 [senior] years, education level (grade 8 or lower, grades 9–12, and university/college), and BMI (< 18.5 [thin], ≥ 18.5 but < 25 [normal], 25 to < 30 [overweight], and ≥ 30 [obese]).

Continuous variables and categorical variables are expressed as the mean (SD) and number and percentage, respectively. To clarify gender differences, we conducted an unpaired *t*-test and Chi-square test between males and females. A two-tailed *P* value < 0.05 was considered significant. Statistical analysis was conducted with IBM SPSS Statistics (Version 22, IBM Japan Ltd.).

Table 1 shows the results of the comparative analysis. No significant gender difference was observed in demographic data except for mean age in the young age group. However, a significant gender difference was observed in BMI: overall, females were likely to be more obese (20.5% vs. 10.4%) and to have a less normal BMI (48.7% vs. 60.9%) than their male counterparts. A similar trend of significant gender difference was observed in the age-stratified comparative analysis only in the middle-age group.

Thus, a gender-related difference in BMI was observed among people in WNB, PNG, specifically among middle-aged women, who tended to be more obese than their male counterparts. These results imply that obesity in WNB may vary by gender, and it may be important for stakeholders (e.g., health professionals, policymakers, and others) involved with this health issue to realize this gender gap and develop gender-specific strategies against this health issue in WNB, PNG.

Why does this gender gap exist? In a previous review study, sociocultural factors and biological factors are reported as promising contributing factors for these gender gaps.² For instance, in South Africa, Case and Menendez³ reported that “poverty (hunger) in childhood” and “greater access to resources in adulthood” led women to be at significantly greater risk of obesity than men are. Diversity in both sociocultural and biological factors in each of these countries or regions might be unique contributing factors to the gender gap.

Because an exploration into the contributing factors of gender difference was beyond the scope of the present study, we could not explain the reasons for the observed gender difference. However, knowledge of factors contributing to gender difference is essential to gain a better understanding and to develop effective gender-specific strategies in WNB and the whole of PNG. These contributing factors should be explored in a further nationwide longitudinal study.

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Declaration of Conflicting Interests

The authors declare that they have no conflicts of interest.

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Table 1. Results of a comparative analysis by gender.

	Age ≤ 29 (n=224)				30 $\leq$ Age ≤ 49 (n=216)				50 $\leq$ Age (n=118)				Total (n=558)			
	Female (n=108)		Male (n=116)		Female (n=107)		Male (n=109)		Female (n=54)		Male (n=64)		Female (n=269)		Male (n=289)	
Age (mean $\pm$ SD)	21.5 $\pm$ 4.29 [§]		23.1 $\pm$ 4.01 [§]		37.8 $\pm$ 5.51		37.3 $\pm$ 5.37		58.0 $\pm$ 6.35		58.6 $\pm$ 8.00		33.7 $\pm$ 13.5		35.9 $\pm$ 14.4	
Education, Student, N (%)																
(Under Grade 8)	21	(35.6)	13	(23.6)	0	(0)	0	(0)	0	(0)	0	(0)	21	(35.6)	13	(23.6)
(Grade 9 to 12)	36	(61.0)	38	(69.1)	0	(0)	0	(0)	0	(0)	0	(0)	36	(61.0)	38	(69.1)
(University/college)	2	(3.39)	4	(7.3)	0	(0)	0	(0)	0	(0)	0	(0)	2	(3.39)	4	(7.27)
Education, Non-Student, N (%)																
(Under Grade 8)	20	(40.8)	19	(31.2)	49	(45.8)	42	(38.5)	42	(77.8)	36	(56.3)	111	(52.9)	97	(41.5)
(Grade 9 to 12)	26	(53.1)	36	(59.0)	48	(44.9)	54	(49.5)	9	(16.7)	25	(39.1)	83	(39.5)	115	(49.2)
(University/college)	3	(6.12)	6	(9.84)	10	(9.35)	13	(11.9)	3	(5.56)	3	(4.69)	16	(7.62)	22	(9.40)
BMI																
18.5 $\leq$ BMI $<$ 25, N (%)	70	(64.8)	84	(72.4)	43 [†]	(40.2)	63 [†]	(57.8)	18	(33.3)	29	(45.3)	131 [*]	(48.7)	176 [*]	(60.9)
25 $\leq$ BMI $<$ 30, N (%)	24	(22.2)	24	(20.7)	31	(29.0)	31	(28.4)	21	(38.9)	24	(37.5)	76	(28.3)	79	(27.3)
30 $\leq$ BMI, N (%)	12	(11.1)	6	(5.17)	31 [†]	(29.0)	14 [†]	(12.8)	12	(22.2)	10	(15.6)	55 [*]	(20.5)	30 [*]	(10.4)
BMI $<$ 18.5, N (%)	2	(1.85)	2	(1.72)	2	(1.87)	1	(0.92)	3	(5.56)	1	(1.56)	7	(2.60)	4	(1.38)

SD, standard deviation; BMI, body mass index.

§, Unpaired *t*-test (P=0.004); †, Chi square test (P=0.005); ‡, Chi square test (P=0.003)