Association between BMI and CKD in Asian Populations: A Participant-level Meta-Analysis

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Purpose

- To examine the association between body mass index (BMI), obesity and prevalent CKD in the general adult population in Asia.

Methods

- The Asian Eye Epidemiology Consortium (AEEC) is a collaborative network of population-based studies across Asia, established in 2018.
- 8 population-based studies including adults from China, India, Russia (Asian), Singapore and South Korea provided individual-level data (n=50,037). CKD was defined as an estimated glomerular filtration rate (eGFR) <60 mL/min/1.73 m^2. BMI was analyzed in categories as (<25 kg/m^2, normal), (25–29.9 kg/m^2, overweight), and (≥30 kg/m^2, obese) and as a continuous variable (per standard deviation (SD) increase).
- Cross-sectional association between BMI and CKD was evaluated in each study using multivariable logistic regression models, and individual estimates were pooled using random-effect meta-analysis. Associations were evaluated in subgroups of age, gender, smoking, diabetes, and hypertension status.
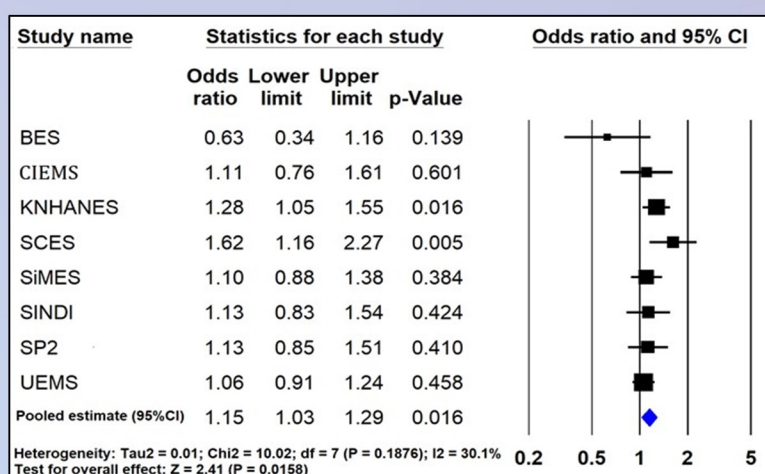
Results

- Of 50037 adults, 4258 (8.5%) had CKD. 13328 (26.6%) individuals were overweight while 4440 (8.9%) were obese.
- Prevalence of any CKD ranged from 3.5% - 29.1% across studies.
- Prevalence of overweight ranged from 6.6% - 39.4%.
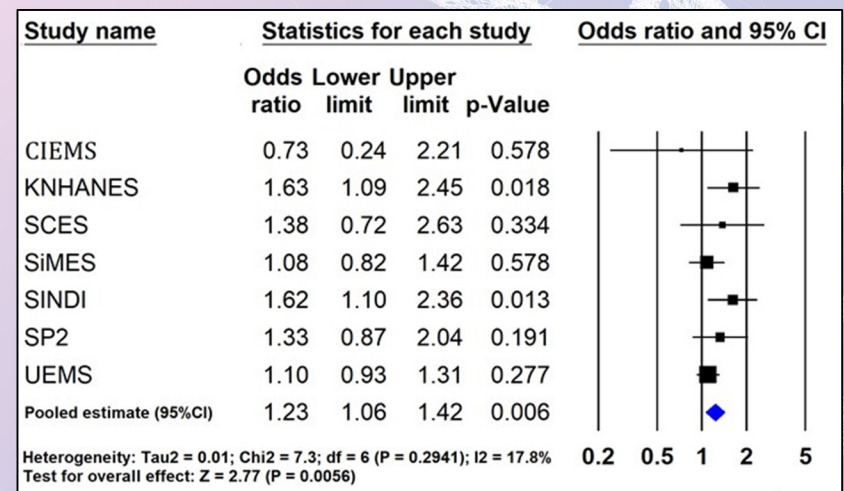- Prevalence of obese ranged from 1.1% - 29.7%.
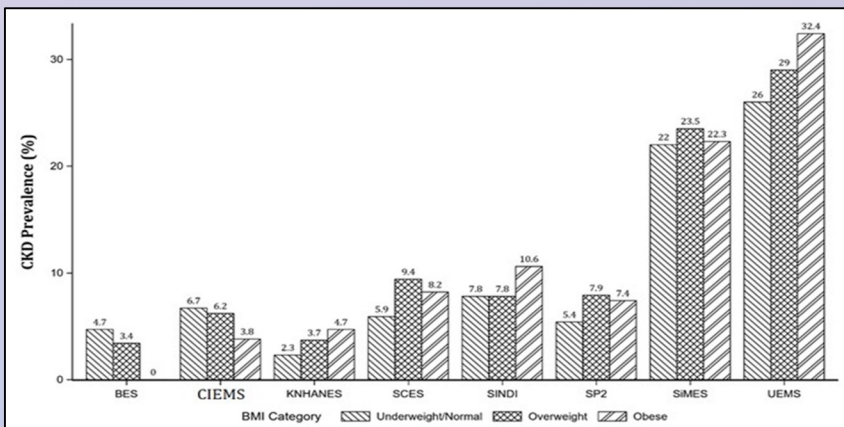
Association Between Overweight and CKD

- In pooled analysis, both overweight and obese were associated with increased odds of CKD with pooled OR (95% CI) of 1.15 (1.03-1.29) and 1.23 (1.06-1.42) respectively.

Study name	Odds ratio	Lower limit	Upper limit	p-Value	Odds ratio and 95% CI
BES	0.63	0.34	1.16	0.139	
CIEMS	1.11	0.76	1.61	0.601	
KNHANES	1.28	1.05	1.55	0.016	
SCES	1.62	1.16	2.27	0.005	
SiMES	1.10	0.88	1.38	0.384	
SINDI	1.13	0.83	1.54	0.424	
SP2	1.13	0.85	1.51	0.410	
UEMS	1.06	0.91	1.24	0.458	
Pooled estimate (95%CI)	1.15	1.03	1.29	0.016	

Heterogeneity: Tau2 = 0.01; Chi2 = 10.02; df = 7 (P = 0.1876); I2 = 30.1%
Test for overall effect: Z = 2.41 (P = 0.0158)

Results

Association Between Obesity and CKD

Study name	Odds ratio	Lower limit	Upper limit	p-Value	Odds ratio and 95% CI
CIEMS	0.73	0.24	2.21	0.578	
KNHANES	1.63	1.09	2.45	0.018	
SCES	1.38	0.72	2.63	0.334	
SiMES	1.08	0.82	1.42	0.578	
SINDI	1.62	1.10	2.36	0.013	
SP2	1.33	0.87	2.04	0.191	
UEMS	1.10	0.93	1.31	0.277	
Pooled estimate (95%CI)	1.23	1.06	1.42	0.006	

Heterogeneity: Tau2 = 0.01; Chi2 = 7.3; df = 6 (P = 0.2941); I2 = 17.8%
Test for overall effect: Z = 2.77 (P = 0.0056)

Subgroup association between BMI and CKD

- When evaluated as a continuous variable, BMI was not significantly associated with CKD (p=0.133).
- In subgroup analyses, significant associations between BMI and CKD were observed in adult males, non-smokers, and those with diabetes and arterial hypertension (all p<0.05).

Association between BMI and CKD subgroups

Subgroups	No. at risk	CKD Prevalence, %	Multivariable OR (95% CI)*	P – value
Age, years				
<60	33304	3.40	1.05 (0.98, 1.13)	0.1
≥60	16733	18.69	0.98 (0.93, 1.02)	0.3
Sex				
Male	22823	7.24	1.13 (1.06, 1.20)	< 0.001
Female	27214	9.58	1.02 (0.97, 1.07)	0.4
Current smoking				
No	41837	9.29	1.06 (1.01, 1.10)	0.008
Yes	8200	4.54	1.09 (0.95, 1.24)	0.2
Diabetes				
No	44186	7.29	1.06 (0.98, 1.15)	0.1
Yes	5851	17.72	1.05 (1.01, 1.10)	0.02
Hypertension				
No	31842	4.83	1.05 (0.97, 1.14)	0.2
Yes	18195	14.95	1.06 (1.01, 1.11)	0.02

* Models were adjusted for BMI, total and HDL cholesterol

Conclusions

- This study suggests that overweight and obese BMI levels are associated with higher CKD prevalence among Asian cohorts.
- If confirmed in longitudinal studies, these results may have clinical implications in risk stratification and preventive measures, considering that obesity and CKD are two major chronic diseases with substantial public health burden worldwide.
- Future studies should investigate if significant differences exist across Asian, European, and other geographical regions.