THE KOREAN SOCIETY OF NEPHROLOGY
APCN & KSN 2024
June 13(Thu) - 16(Sun), 2024 Coex, Seoul, Korea
APSN
Promoting Sustainable Kidney Health: The Asia-Pacific and Beyond

Abstract Submission No.: A-0112

Obesity as a Key Predictor of Chronic Kidney Disease in Adults - A Comprehensive Systematic Review and Meta-Analysis

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Objectives : The study focuses on the complex relationship between obesity and chronic kidney disease (CKD), a significant public health concern due to its clinical repercussions. Obesity is a known risk factor for CKD's development and progression, influenced by various mechanisms such as hemodynamic factors, metabolic effects, and lipid nephrotoxicity. These elements can predispose individuals to CKD and exacerbate its complications. Histopathological changes linked to obesity, like obesity-related glomerulopathy, and associated conditions such as atherosclerosis, hypertension, and type 2 diabetes, further elevate CKD risks. Estimating the glomerular filtration rate (GFR) in obese individuals, crucial for CKD classification and medication dosage, presents additional challenges. This relationship's complexity extends to the role of adipokines in reducing oxidative stress in renal cells, suggesting intricate signaling pathways in obesity-induced kidney injury. Maternal obesity's influence on the offspring's CKD risk highlights obesity's long-term impact on kidney function, stressing the importance of intergenerational health.
Methods : In this study, a systematic review and meta-analysis investigated obesity, measured by body mass index, as a predictor of end-stage renal disease in adults. Twenty four databases were searched for relevant cohort studies, considering adults with obesity but no prior renal disease who progressed to CKD. The Revman software facilitated data analysis.
Results : Results revealed a relative risk of 1.60 (95%CI: 1.57–1.63) for obese individuals developing CKD compared to the non-obese population. This study confirms obesity as a crucial risk factor in CKD's prevention.
Conclusions : The relationship between obesity and chronic kidney disease (CKD) requires extensive study. Choi & Ha emphasize evaluating long-term effects of treatments like bariatric surgery on CKD. Lee et al. find intra-abdominal fat a major risk factor, especially in normal-weight individuals. Yim & Yoo investigate obesity's intricate roles in CKD. These studies underscore the significance of understanding obesity's prolonged impact on CKD, underscoring the necessity for continuous research and public health focus.

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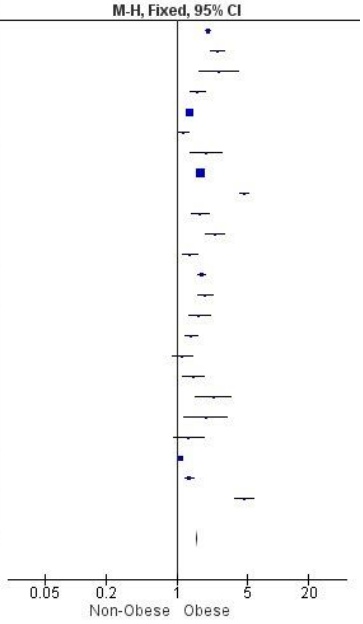
Study or Subgroup	Obese Events	Obese Total	Non-Obese Events	Non-Obese Total	Weight	Risk Ratio M-H, Fixed, 95% CI
Bae 2021	2585	846217	3268	2184667	12.2%	2.04 [1.94, 2.15]
Cao 2015	124	480	652	6372	0.6%	2.52 [2.13, 2.99]
Chang 2013	34	550	43	1804	0.1%	2.59 [1.67, 4.03]
Chang 2016	177	8149	729	54100	1.3%	1.61 [1.37, 1.90]
Cho 2020	3519	113299	4746	206375	22.4%	1.35 [1.29, 1.41]
Gelber 2005	311	2220	1064	8884	2.8%	1.17 [1.04, 1.32]
Hashimoto 2015	37	569	86	2567	0.2%	1.94 [1.33, 2.82]
Herrington 2017	5080	374882	8097	1030134	28.8%	1.72 [1.66, 1.79]
Hsu 2006	474	29813	997	290439	1.2%	4.63 [4.15, 5.16]
Iseki 2004	149	25642	255	75111	0.9%	1.71 [1.40, 2.09]
Jung 2015	214	16030	142	25164	0.7%	2.37 [1.92, 2.92]
Komura 2013	119	306	347	1200	0.9%	1.34 [1.14, 1.59]
Lae 2017	1022	17764	891	27248	4.7%	1.76 [1.61, 1.92]
Lew 2017	150	5451	677	47326	0.9%	1.92 [1.62, 2.29]
Lin 2017	152	1248	91	1243	0.6%	1.66 [1.30, 2.13]
Nam 2018	397	3659	385	4930	2.2%	1.39 [1.22, 1.59]
Olivo 2017	140	1065	114	978	0.8%	1.13 [0.89, 1.42]
Othman 2016	31	39	47	86	0.2%	1.45 [1.13, 1.87]
Reynolds 2007	25	4656	325	139146	0.1%	2.30 [1.53, 3.45]
Song 2015	29	588	33	1293	0.1%	1.93 [1.18, 3.15]
Stengel 2003	40	1543	149	7539	0.3%	1.31 [0.93, 1.85]
Tokashiki 2009	1944	11938	2516	16844	13.9%	1.09 [1.03, 1.15]
Tsujimoto 2014	366	2402	11782	103209	3.6%	1.33 [1.21, 1.47]
Vivante 2012	93	29986	781	1164718	0.3%	4.63 [3.73, 5.73]
Total (95% CI)		**1498496**		**5401377**	**100.0%**	**1.60 [1.57, 1.63]**
Total events	17212		38217			

Heterogeneity: Chi² = 936.14, df = 23 (P < 0.00001); I² = 98%
Test for overall effect: Z = 49.13 (P < 0.00001)



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Study or Subgroup	Obese Events	Obese Total	Non-Obese Events	Non-Obese Total	Weight	Risk Ratio M-H, Random, 95% CI
2.1.1 <9						
Bae 2021	2585	846217	3268	2184667	4.7%	2.04 [1.94, 2.15]
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Tsujimoto 2014	366	2402	11782	103209	4.6%	1.33 [1.21, 1.47]
Subtotal (95% CI)		**1356819**		**3562088**	**45.7%**	**1.70 [1.49, 1.95]**
Total events	12277		29058			

Heterogeneity: Tau² = 0.04; Chi² = 222.26, df = 10 (P < 0.00001); I² = 96%
Test for overall effect: Z = 7.85 (P < 0.00001)

2.1.2 9-14						
Chang 2016	177	8149	729	54100	4.4%	1.61 [1.37, 1.90]
Gelber 2005	311	2220	1064	8884	4.5%	1.17 [1.04, 1.32]
Iseki 2004	149	25642	255	75111	4.2%	1.71 [1.40, 2.09]
Komura 2013	119	306	347	1200	4.4%	1.34 [1.14, 1.59]
Lae 2017	1022	17764	891	27248	4.6%	1.76 [1.61, 1.92]
Nam 2018	397	3659	385	4930	4.5%	1.39 [1.22, 1.59]
Reynolds 2007	25	4656	325	139146	3.3%	2.30 [1.53, 3.45]
Stengel 2003	40	1543	149	7539	3.6%	1.31 [0.93, 1.85]
Tokashiki 2009	1944	11938	2516	16844	4.7%	1.09 [1.03, 1.15]
Subtotal (95% CI)		**75877**		**335002**	**38.1%**	**1.45 [1.23, 1.71]**
Total events	4184		6661			

Heterogeneity: Tau² = 0.05; Chi² = 111.59, df = 8 (P < 0.00001); I² = 93%
Test for overall effect: Z = 4.48 (P < 0.00001)

2.1.3 >14						
Chang 2013	34	550	43	1804	3.1%	2.59 [1.67, 4.03]
Hsu 2006	474	29813	997	290439	4.5%	4.63 [4.15, 5.16]
Lew 2017	150	5451	677	47326	4.3%	1.92 [1.62, 2.29]
Vivante 2012	93	29986	781	1164718	4.2%	4.63 [3.73, 5.73]
Subtotal (95% CI)		**65800**		**1504287**	**16.2%**	**3.24 [1.99, 5.30]**
Total events	751		2498			

Heterogeneity: Tau² = 0.23; Chi² = 78.22, df = 3 (P < 0.00001); I² = 96%
Test for overall effect: Z = 4.70 (P < 0.00001)

Total (95% CI)		**1498496**		**5401377**	**100.0%**	**1.79 [1.57, 2.05]**
Total events	17212		38217			

Heterogeneity: Tau² = 0.10; Chi² = 936.14, df = 23 (P < 0.00001); I² = 98%
Test for overall effect: Z = 8.50 (P < 0.00001)
Test for subgroup differences: Chi² = 9.79, df = 2 (P = 0.008), I² = 79.6%