Sex Differences in the Relative Risk (RR) of Death of the Attention Deficit Hyperactivity Disorder (ADHD) Patients: A Systematic Review and Meta-analysis Kai-Jie Yang,^{1, 2} Kuan-Pin Su, ^{1, 2, 3, 4} Jane Pei-Chen Chang ^{1, 3}



1Department of Psychiatry and Mind-Body Interface Laboratory (MBI-Lab), China Medical University, Taichung, Taiwan, 2Graduate Institute of Biomedical Sciences, China Medical University, Taichung, Taiwan 3College of Medicine, China Medical University, Taichung, Taiwan, 4An-Nan Hospital, China Medical University, Tainan, Taiwan

ABSTRACT

Objectives: Previous studies have shown that ADHD patients have a higher risk of experiencing unnatural causes of death and natural causes of death compared to the general population. Thus, this meta-analysis is aimed to compare the RR of death in ADHD patients focusing on gender differences.

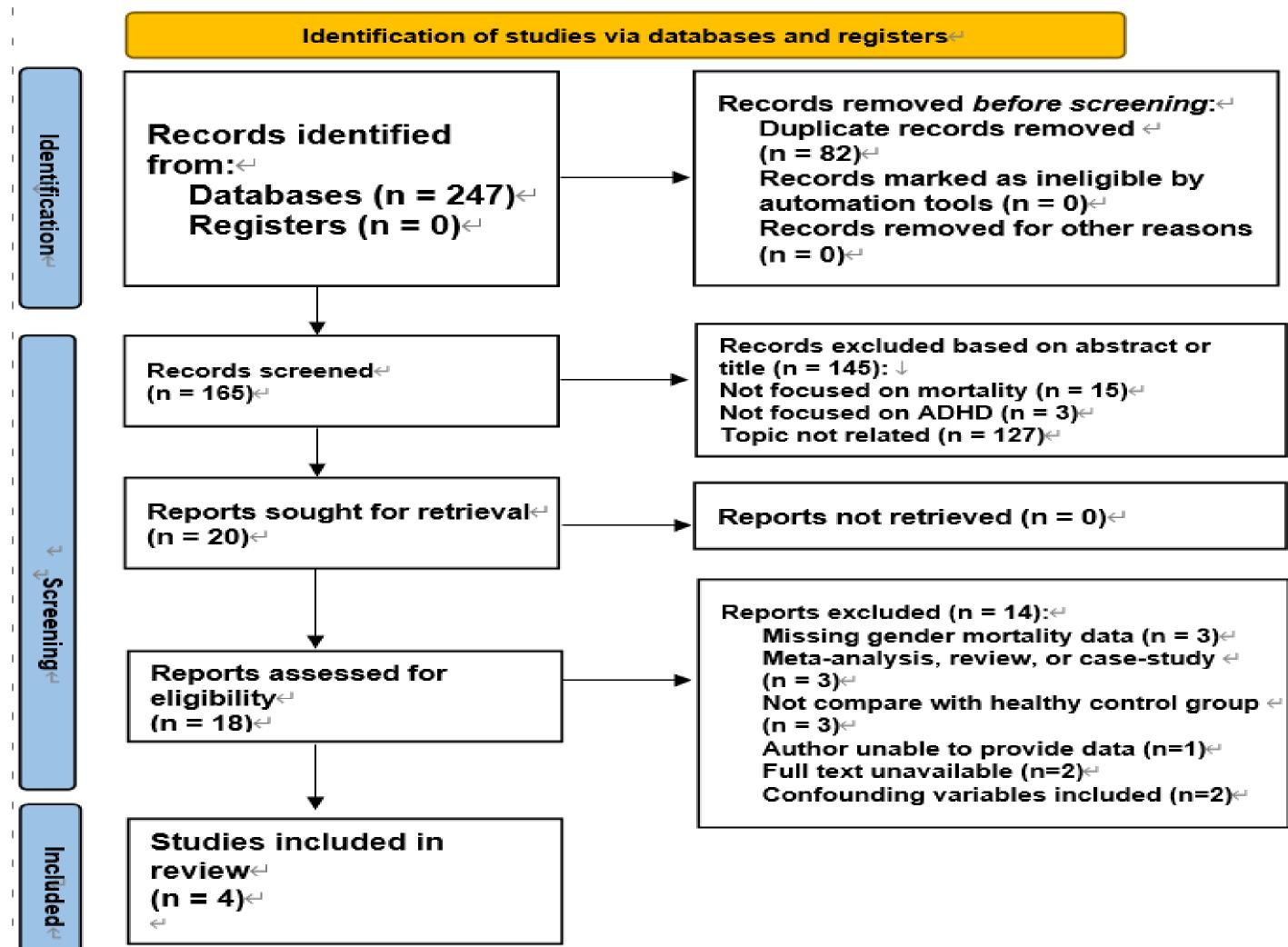
Method: A computerized search was performed for all publications available up to 30th of July, 2022 through PubMed, PsychINFO, Embase, Web of Science with keywords "attention deficit hyperactivity disorder" and "mortality" and "cohort study."

Results: Females with ADHD (RR, 1.83; 95% CI,1.61-2.07) have a 1.83 times higher RR of death than non-ADHD females. Whereas males with ADHD have 1.63 times higher RR of death than non-ADHD males (RR, 1.63; 95% CI, 1.23-2.15).

Conclusion: This systematic review and meta-analysis show that ADHD was associated with an increased mortality risk in both males and females.

Introduction

- ADHD patients have a higher risk of experiencing mortality
- □ Unnatural cause of death: suicide, unintentional injury, homicide
- □ Natural cause of death: all the causes of death except for the above three Method



- The RR of death was higher for non-ADHD population. (Fig. 1.
- Males with ADHD have only male. (Fig. 1B and Table 2)
- Females with ADHD have a 1 than non-ADHD female. (Fig 1

Figure 1. Relative Risk of A Male; C: Female)

Koisaari et al, 2015 Chen et al., 2019 Sun et al, 2019 Schiavone et al., 2022

Total (fixed effects) Total (random effects)

Koisaari et al, 2015 Chen et al., 2019 Sun et al, 2019 Schiavone et al., 2022

Total (fixed effects) Total (random effects)

Koisaari et al, 2015 Chen et al., 2019 Sun et al, 2019 Schiavone et al., 2022

Total (fixed effects) Total (random effects)



0.1

Result

or patients with ADHD than the	References↩	ADHD←		< Non-ADHD⊲		Relative Risk∉	95% CI⊲	P←	Z↩コ	
1A and Table 1).	-	Mortality	lity∈ Total⊂		[ortality	Total↩				Ą
	oisaari et , 2015⊄	11↩	122↩□	÷.	0↩	94 ↩	17.764↩	1.060 to 297.668↩	Ļ	Ę
\mathcal{O}	ien et al., 19∉	7 2 7↩ ⁻	275980 ↩	÷	3594↩	1931860 ↩	1.416↩□	1.308 to 1.533	Ą	Ą
ADHD Patients (A: Overall, B:	n et al., 19⊄	424↩	86670↩	←	6231↩	2588945↩	2.033	1.843 to 2.242↩	Ļ	Ę
	hiavone al., 2022⊄	11↩	115↩	÷	20 ↩ [□]	508 ↩⊃	2.430↩	1.198 to 4.929↩	Ą	Ą
le (ra	tal andom čects)←	117 3 ↩	362887↩	÷.	9845↩	4521407 ↩	1.843 ↩ ⁻	1.323 to 2.568↩	<0.001↩	3.614

ADHD, attention deficit hyperactivity disorder; Motality, number of dearh; Total, total number of participants in the group

•			
10		100	1000
•			
1	10	100	1000
•			
1	10	100	1000
R	elative r	isk	

References↩	ADHD (male/female)<		÷		Relative Risk↩ (male/female)↩	95% CI↩ (male/female)↩	P← (male/fem	Z↩ (male/femal
			/	()	()	ale)⊖	(e)⊱⊐	
Koisaari et al., 2015⊖	11/1↩	122/36	- 0/0-⊐	94/54↩	17.764/4.459↩	1.060 to 297.668/↩ 0.187 to 106.532↩	Ą	4
Chen et al., 2019↩	7 2 7/181↩	275980/ 66574↩	< 3594/742< ⊂	1931860/ 466018↩	1.416/1.708↩	1.308 to 1.533/↩ 1.452 to 2.008↩	¢	¢
Sun et al., 2019∉	424/100 ↩ [□]	86670/ 28751↩	ċ 6231/2177 ∢	2588945/ 1272074↩	2.033/2.032↩	1.843 to 2.242/↩ 1.664 to 2.483↩	¢	Ą
Schiavone et al., 2022∉	11/2↩ [□]	115/33	<i>∹</i> 20/7<⊐	508/270 ↩	2.430/2.338	1.198 to 4.929/↩ 1.664 to 2.483↩	\leftarrow	¢
Total (random/fix ed effects)↩	117/284↩	362887/ 95394↩	€ 9845/2926 €	4521407/ 1738416↩	1.843/1.825	1.323 to 2.568/↩ 1.664 to 2.483↩	<0.001/↩ <0.001↩	3.614/↩ 9.379↩



. En ber and adults with attention deficit hyperactivity disorder: a nation wide cohort study. The Lancet, 385 (9983), 2190-2196; Koisaari, T., Michelsson, K., Holopainen, J. F., Mortensen, P. B., & Tervo, adolescents, and adults with attention deficit hyperactivity disorder: a nation wide cohort study. The Lancet, 385 (9983), 2190-2196; Koisaari, T., Michelsson, K., Holopainen, J. M., Maksimainen, R., Päivänsalo, J., Rantala, K., & Tervo, a nation wide cohort study. The Lancet, 385 (9983), 2190-2196; Koisaari, T., Michelsson, K., Holopainen, J. M., Maksimainen, J. F., Mortensen, P. B., & Pedersen, M. G. (2015). Mortality in children, adolescents, and adults with attention-Deficit/Hyperactivity Disorder and Mortality Risk in Taiwan. JAMA network open, 2(8), e198714-e198714; Dalsgaard, S. D., Leckman, J. F., Mortensen, P. B., & Tervo, adolescents, and adults with attention-Deficit/Hyperactivity Disorder and Mortality Risk in Taiwan. JAMA network open, 2(8), e198714-e198714; Dalsgaard, S. D., Leckman, J. F., Mortensen, P. B., & Tervo, adolescents, and adults with attention-Deficit/Hyperactivity Disorder and Mortality Risk in Taiwan. JAMA network open, 2(8), e198714-e198714; Dalsgaard, S. D., Leckman, J. F., Mortensen, P. B., & Tervo, adolescents, and adults with attention-Deficit/Hyperactivity Disorder and Mortality Risk in Taiwan. JAMA network open, 2(8), e198714-e198714; Dalsgaard, S. D., Leckman, J. F., Mortensen, P. B., & Tervo, adolescents, adoles T. (2015). Traffic and Criminal Behavior of Adults with Attention Deficit-Hyperactivity with a Prospective Follow-Up from Birth to the Age of 40 Years. Traffic Inj Prev, 16(8), 824-830; Schiavone, N., Virta, M., Leppämäki, S., Launes, J., Vanninen, R., Tuulio-Henriksson, A., . . . Hokkanen, L. (2022). Mortality in individuals with childhood ADHD or subthreshold symptoms – a prospective perinatal risk cohort study over 40 years [Article]. BMC Psychiatry, 22(1).



Table 1. Overall ADHD Relative Risk

Table 2. Male/Female ADHD Patients Relative Risk Data

ADHD was associated with an increased mortality risk in both male and female.