Shift work and the risk for metabolic syndrome among healthcare workers: A systematic review and meta-analysis

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				Odds Ratio	Odds Ratio
Study or Subgroup	log[Odds Ratio]	SE	Weight	IV, Random, 95% Cl	IV, Random, 95% Cl
Copertaro et al. (2007)	0.8109	0.3745	18.1%	2.25 [1.08, 4.69]	
Farha and Alefishat (2018)	0.4886	0.5272	13.8%	1.63 [0.58, 4.58]	
Holanda et al. (2018)	0.2852	0.7112	9.9%	1.33 [0.33, 5.36]	
Jung et al. (2020)	-0.3011	0.2426	22.2%	0.74 [0.46, 1.19]	
Niazi et al. (2018)	1.3788	0.4418	16.1%	3.97 [1.67, 9.44]	│ — -
Ritonja et al. (2018)	0.6845	0.3097	20.1%	1.98 [1.08, 3.64]	
Total (95% CI)			100.0%	1.71 [0.98, 2.97]	◆
Heterogeneity: Tau ² = 0.30; Chi ² = 15.34, df = 5 (P = 0.009); l ² = 67%				`%	0.02 0.1 1 10 50
Test for overall effect: Z = 1.89 (P = 0.06)					Reduced odds of MetS Increased odds of MetS

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Figure S4. Pooled risk estimates of night shift work and metabolic syndrome for nurses



Figure S5. Funnel plots to assess publication bias

Study author and year	1. Was the sample representative of the target population?	2. Were study participants recruited in an appropriate way?	3. Was the sample size adequate?	4. Were the study subjects and setting described in detail?	5. Was the data analysis conducted with sufficient coverage of the identified sample?	6. Were valid methods used for the identification of the condition?	7. Was the condition measured in a standard, reliable way for all participants?	8. Was there appropriate statistical analysis?	9. Was the response rate adequate, and if not, was the low response rate managed appropriately?	Total number of "yes"
Arias et al.,2021	No	Unclear	Yes	Yes	Yes	Yes	Yes	Yes	Yes	7
Copertaro et al., 2007	Yes	Unclear	Unclear	Yes	Yes	Yes	Yes	Yes	Yes	7
Farha and Alefishat 2018	No	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	7
Holanda et al., 2018	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	8
Jung et al., 2020	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	9
Kirk et al., 2015	No	Yes	Unclear	Yes	Yes	Yes	Yes	Yes	Unclear	6
Korsiak et al., 2018	No	Yes	Unclear	Yes	Yes	Yes	Yes	Yes	Unclear	6
Kumar et al., 2021	Unclear	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Unclear	7
Lajoie et al., 2015	Yes	Yes	Unclear	Yes	Yes	Yes	Yes	Yes	Yes	8
Niazi et al., 2018	Yes	Yes	Unclear	Yes	Yes	Yes	Yes	Yes	Yes	8
Pietroiusti et al., 2010	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	9
Ritonja et al., 2018	Unclear	Yes	Unclear	Yes	Yes	Yes	Yes	Yes	Yes	7

Area	Recommended policies and interventions
Work schedules	 Shift schedules should be created using ergonomic criteria that have been proven to reduce stress and limit negative health and well-being impacts by preventing or limiting circadian disturbance and the buildup of sleep deficits and fatigue. Regulations need to set out limits on maximum shift length, maximum consecutive nights, minimum interval between breaks and weekly and monthly work hours. Shift schedules should be adjusted to the individual job demands, personal qualities, socioeconomic conditions, and cultural background of the people involved.
Healthcare	 Since healthcare employees are subjected to high stress, mental health support programs such as meditation, therapy activities should be organized. Participating in health screenings covered by benefits, specifically yearly or biannual health screenings for metabolic syndrome and circadian de-synchrony. Before beginning shift work, and at regular intervals later, medical health examinations should be scheduled to assess the compatibility of health issues with shift work
Organizational	 Inadequate staffing can result in an excessive individual workload, which may increase the likelihood of work-related stress, error, and health risks for both patients and staff. Therefore, appropriate worker to patient ratios is crucial. It may be appropriate to nominate one or more employees to assume responsibility for managing the risks connected with shift employment. Broadening their understanding of shift work and familiarizing them with relevant health and safety policy and regulations will aid in the development of a constructive atmosphere for dealing with shift-working arrangements. Laws and regulations regarding additional rest breaks for meals and naps, supplementary rest-days or holidays to aid recovery, improved canteen facilities and transportation services, health screening, training and rehabilitation courses for shift workers, periodic transfers to day work, and progressive reduction of night work with increasing age could be established.
Healthy workplace interventions	• Workplace dietary interventions could be implemented. Shift workers could be given meal replacements with adequate amount of daily nutrition to consume during their busy work hours.

Table S2. Recommended policies and interventions to reduce the incidence of MetS among shift workers.

Data S1: Search strategy

Example Database Search Terms: Scopus

Schedule (TITLE-ABS-KEY ("shift work" OR "Shift Work Schedule" OR "Work Tolerance" OR "Night Shift" OR "night work" OR "irregular working hours" OR "night duty") AND TITLE-ABS-KEY ("Metabolic Syndrome" OR "Dysmetabolic Syndrome" OR "Cardiometabolic Syndrome" OR "Metabolic X Syndrome" OR "Syndrome X" OR "deadly quartet" OR "insulin resistance syndrome" OR "Reaven's Syndrome") AND TITLE-ABS-KEY ("health personnel" OR "health care worker" OR "health worker" OR "care giver" OR "physician" OR "medical staff" OR "nurses" OR "hospital employees" OR "hospital staff") AND LANGUAGE (English) AND ALL ("humans") AND NOT ALL ("animals") AND NOT ALL ("animals and humans"))

Other databases searched: Pubmed, Web of Science