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Meta-Analysis

Burnout syndrome among orthopedic surgeons: a systematic review and meta-analysis of worldwide data

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ABSTRACT

Burnout syndrome has been associated with serious consequences for healthcare providers and healthcare systems. Orthopedic surgeons, as professionals in a specialty that is physically and mentally demanding, commonly experience high-stress work circumstances. We aimed to identify and assess the burden of burnout syndrome among orthopedic surgeons. This study was conducted in accordance with the guidelines and recommendations of the preferred reporting items for systematic reviews and meta-analyses (PRISMA) 2020. Studies were shortlisted by searching PubMed, EBSCO, Scopus, Web of Science through Clarivate, and Google Scholar using keywords and medical subject headings terms related to burnout syndrome and orthopedics. Rayyan-intelligent systematic reviews were used to manage citations and remove duplicates. We used review manager 5.4 for quantitative data synthesis. Our meta-analysis included data from 16 studies on 2,564 orthopedic physicians, and quantitative data synthesis revealed that the pooled prevalence of high emotional exhaustion (EE) was 34% (95% CI: 27%, 40%), that of high depersonalization (DP) was 39% (95% CI: 29%, 50%), that of low sense of personal accomplishment (PA) was 24% (95% CI: 17%, 31%), and that of overall burnout was 43% (95% CI: 33%, 53%). There was significant heterogeneity in all analyses. In conclusion, burnout syndrome shows varying prevalence across different countries. The development of preventive measures may be necessary to alleviate the high rates of burnout among orthopedic surgeons.

Keywords: Burnout syndrome, Orthopedic surgery, Meta-analysis

INTRODUCTION

Loss of enthusiasm (EE), sense of cynicism (DP), and diminished sense of PA are hallmarks of burnout.[1] Surgeons invest high levels of effort, work long hours, and make personal sacrifices to perform their jobs, particularly during the early periods of their careers.[2] Such dedication to this difficult occupation may have great benefits for patients with severe health issues; however, this devotion also carries the possibility of burnout, which might have detrimental effects for both the surgeons and their patients.[3,4]

Practice or training in orthopedics presents mental, physical, and emotional challenges. It is essential to understand burnout among orthopedic surgeons because of its possible negative effects on doctors, their patients, and healthcare organizations. The number of studies addressing burnout among healthcare workers, particularly physicians, has recently increased, but there are concerns about burnout during the early years of the profession, which includes the residency phase.[5-8] As mental and physical health are crucial for the development of cognitive function and decision-making skills, burnout may have several detrimental effects on patient care.[9,10] To address this problem, it is vital to identify possible risk factors for burnout. However, these

variables may be multidimensional and differ across specialties.[9]

EE describes the sensation of having one's emotional reserves completely emptied without replenishment.[9] Work overload and interpersonal issues are the main causes of such exhaustion. Individuals with EE lack the motivation to go to work or help individuals in need.[11] The EE component of burnout is a fundamental stress factor.[9]

DP is a term used to describe an adverse, harsh, or unduly distant reaction to others that often involves a lack of idealism. It often manifests as a reaction to the overabundance of emotional tiredness, and initially manifests as a kind of emotional "detached worry," or self-protection.[11] The DP element is the interpersonal component of burnout.[9]

A decrease in self-confidence and output at work is referred to as reduced PA.[9] This decreased feeling of self-efficacy has been associated with depression and an inability to handle the demands of work and may be worsened by a lack of social support and career-development possibilities.[11] Growing feelings of inadequacy among staff regarding their capacity to assist customers may lead to judgments of self-imposed failure. The burnout feature of self-evaluation represents the PA component.[9] This systematic review and meta-analysis aimed to assess the burden of burnout syndrome among orthopedic surgeons and resident doctors.

METHODS

Search strategy

We conducted this study according to the guidelines and recommendations of the PRISMA 2020.[12] The study was conducted over a period of five months, from February 2024 to June 2024. This timeframe included the stages of literature search, study selection, data extraction, and quantitative synthesis. Studies were shortlisted by searching the PubMed, EBSCO, Scopus, Web of Science, Clarivate, and Google Scholar databases. For the database search, we used keywords and MeSH terms, along with the Boolean operators AND and OR. Search keywords were suggested and agreed upon by the authors and they included "burnout", "burnout syndrome", "Maslach burnout inventory", "orthopaedics", "orthopedics", "traumatology", "trauma", "reconstruction", "surgery", "surgeons", "residents", and "trainees". In addition to the database searches, we performed a manual Google search. Studies in the English language were included, and searches were conducted for articles dating to January 1974, when burnout was first described.[9]

Inclusion and exclusion criteria

The following inclusion criteria were used for the studies: cross-sectional and observational studies that used the Maslach burnout inventory (MBI) to evaluate burnout among medical professionals and reported its prevalence. Senior physicians and junior physicians with basic medical degrees, such as a bachelor of medicine (MB), a bachelor of medicine and surgery (MBBS, MBChB, or equivalent), or a doctor of medicine (MD), and who were undertaking supervised training and were referred to as "medical residents", "surgical residents" or "trainees" were included in the study.[13] Studies with incomplete or inaccessible data, such as those that examined a specialty, the proportion of residents who were burned out, or the prevalence of burnout, were disregarded. Finally, publications for which the full text was not retrievable, as well as systematic reviews, commentary, editorial pieces, and other publications, were also excluded.

Burnout syndrome diagnosis

The MBI is the most widely accepted and tested measure for assessing burnout among healthcare workers.[13] It has three separate subscales or dimensions: EE, DP, and PA. The DP subscale evaluates cynicism toward people who receive services, whereas the PA subscale measures sentiments of personal pleasure and sense of accomplishment with regard to one's job. The EE subscale represents the notion of emotional overextension by employment. Each subscale receives a score that is then divided into low, moderate, and high categories. High EE score (>30), high DP score (>12), and/or low PA score (<33) might be used to indicate burnout.

Data management and synthesis

Search results were extracted and imported into the Rayyan-intelligent systematic review website, which was used for managing citations and removing duplicates.[13] Title, abstract, and full-text screening were performed, and Microsoft excel was used to extract data from included studies. We used review manager 5.4 for quantitative data synthesis. A random-effects model was applied. Higgin's I^2 test was used to evaluate the percentage of variability across studies, and the cutoff point for heterogeneity was set at I^2>50%. Funnel plots were used to visually assess publication bias, and the p value cutoff point was 0.1 or less.

RESULTS

Search results and characteristics of the included studies

The primary database search yielded 309 studies that were imported to the Rayyan website for duplicate removal. Eighty-four duplicates were removed, and the remaining studies underwent title and abstract screening, after which 176 studies were excluded. The full texts of the remaining 44 papers underwent assessment, and only 16 were deemed suitable for inclusion in the systematic review (Figure 1).

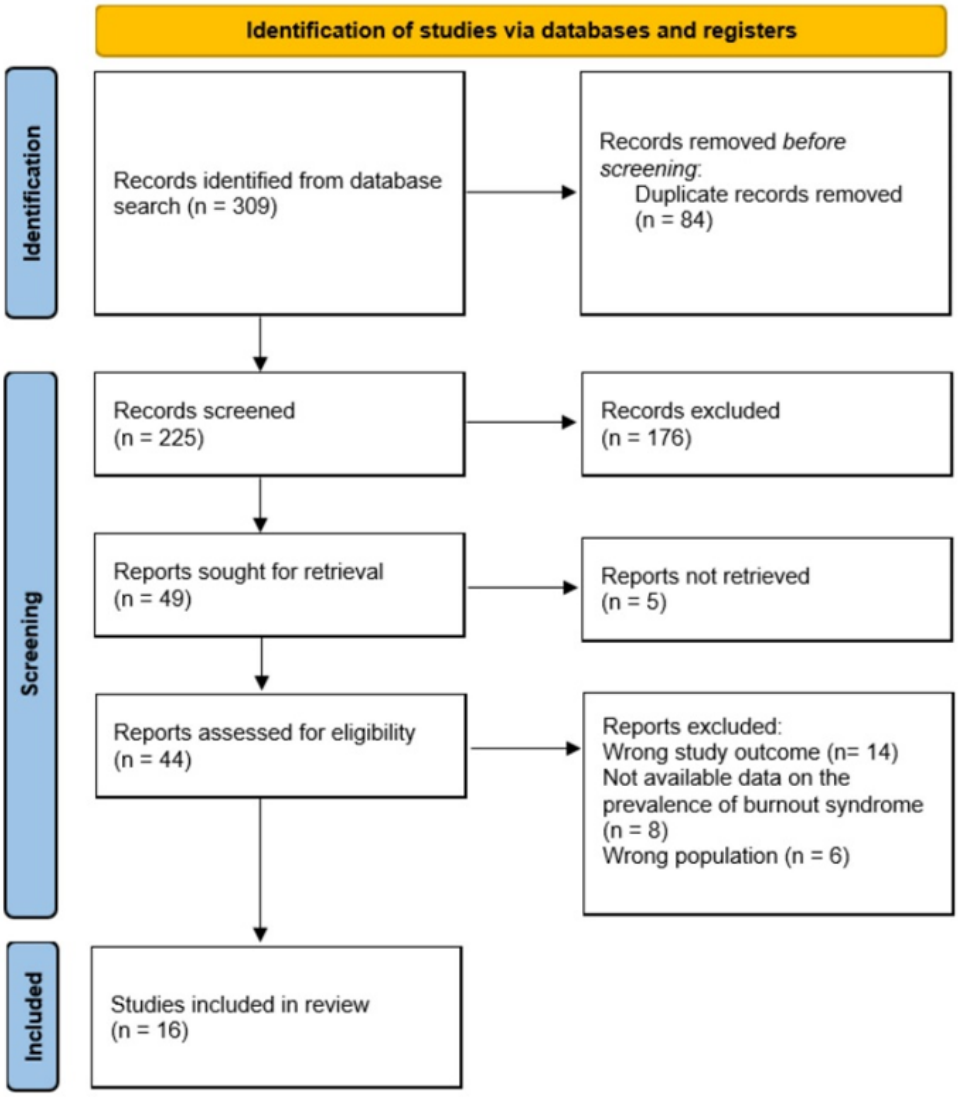

Figure 1: PRISMA flow diagram summarizing the search and study selection.

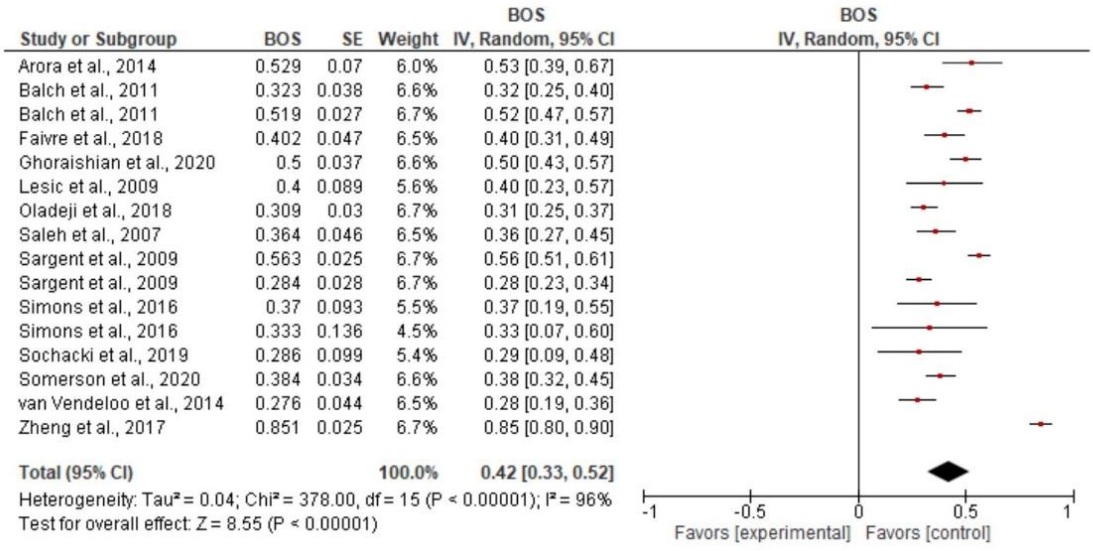

Figure 2: Forest plot of the pooled burnout prevalence among orthopedic physicians, (n=16).

Table 1: Characteristics of the included studies, (n=16).

Study	Country	Population	Age (in years)	Male (%)	High EE (%)	High DP (%)	Low PA (%)	Overall burnout syndrome rate (%)
Arora et al, 2014[14]	Australia	51 trainees	NA	86	45	35	43	53
Balch et al, 2011[15]	USA	155 orthopedic surgeons	58.9	96.7	NA	NA	NA	32
		345 trauma surgeons	48	82.2	NA	NA	NA	51.6
Faivre et al, 2018[22]	France	107 residents	27.6±1.9	65	26	63	33	40
Ghoraishian et al, 2020[23]	Iran	180 surgeons and residents	42.8	94.4	27.2	16.1	37.2	50
Hwang et al, 2018[24]	USA	45 residents	NA	86.7	75	83	NA	NA
Lesić et al, 2009[25]	Serbia	30 surgeons	41.8±9.6	83.3	40	34.5	29.6	40
Oladeji et al, 2018[26]	USA	243 residents	NA	78.1	18.9	25.6	NA	30.9
Sadat-Ali et al, 2005 [27]	Saudi Arabia	69 surgeons	45.7±6.8	NA	50.7	59.4	17.4	NA
Saleh et al, 2007[28]	USA	110 current chairs or chiefs	53.7	NA	36	27	4	36
Sargent et al, 2009[29]	USA	384 residents	NA	88	32	56	18	56
		264 faculty members	NA	92	28.4	24.8	10	28.4
Simons et al, 2016[16]	USA	27 residents	29.2±3.4	NA	29.6	37	25.9	37
		12 surgeons	39±4.5	NA	33.3	25	33.3	33.3
Sochacki et al, 2019[17]	USA	21 surgeons	47.2±9.5	71.4	0	28.6	0	28.6
Somerson et al, 2020[18]	USA	203 residents	NA	80	20	33	19.2	38.4
Terrones-Rodríguez et al, 2016[19]	Mexico	11 residents	NA	NA	54.5	72.7	45.5	100
Van Vendeloo et al, 2014[20]	Netherlands	105 trainees	NA	79	16.2	11.4	NA	27.6
Zheng et al, 2017[21]	China	202 surgeons	NA	100	NA	NA	NA	85.1

EE: emotional exhaustion, DP: depersonalization, PA: personal accomplishment, NA: not available.

The included studies represent 2,564 orthopedic physicians.[14-29] All included studies assessed burnout syndrome among orthopedic and reconstructive surgeons using the MBI. The characteristics of the included studies and their populations are shown in Table 1.

Quantitative data synthesis

Burnout syndrome prevalence

The pooled prevalence of burnout syndrome in the 16 studies in our random-effect meta-analysis was 43% (95% CI: 33%, 53%) (Figure 2). The highest prevalence was reported by Zheng et al at 85.1% (95% CI: 80%, 90%), while the lowest prevalence was reported by van Vendeloo et al at 27.6% (95% CI: 19%, 36%).[20,21] Higgin's I^2 test showed significant heterogeneity in the pooled data (I^2=96%). Visual inspection of the funnel plot revealed some symmetry in the distribution of the plotted data (Figure 3).

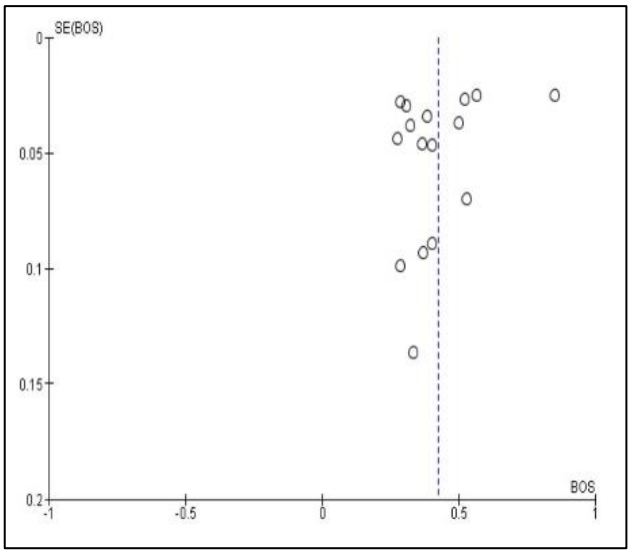

Figure 3: Funnel plot of the pooled data for burnout prevalence, (n=16).

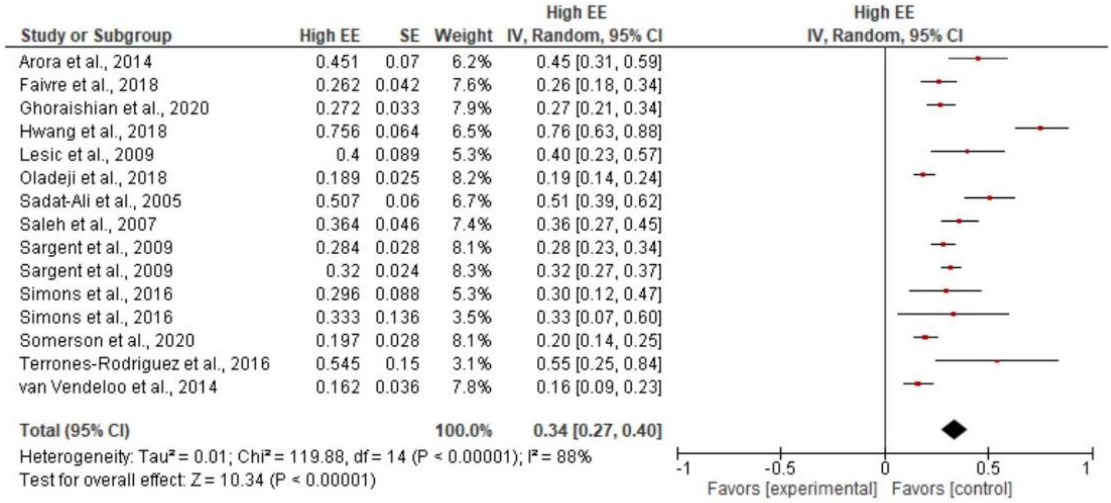

Figure 4: Forest plot of the pooled prevalence of high EE among orthopedic physicians.

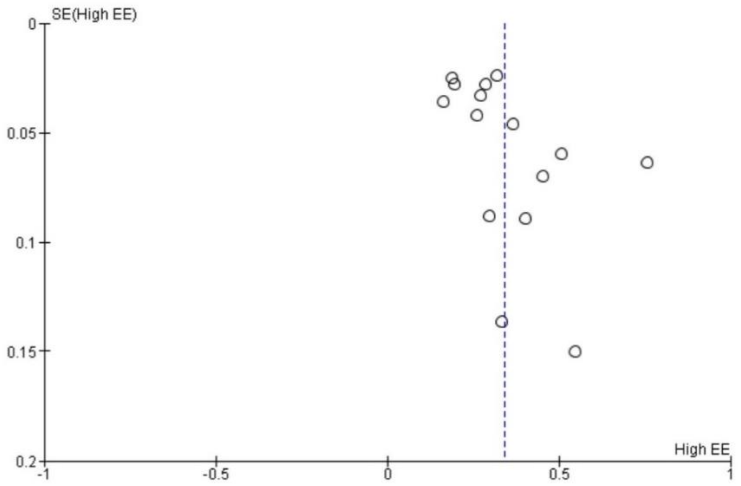

Figure 5: Funnel plot of pooled data for high EE prevalence.

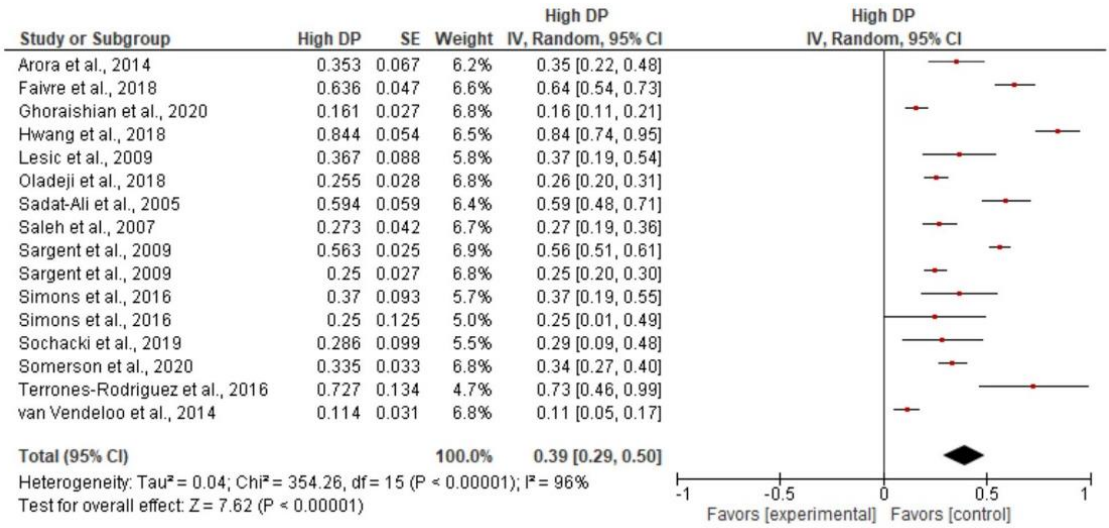

Figure 6: Forest plot of the pooled high DP prevalence among orthopedic physicians.

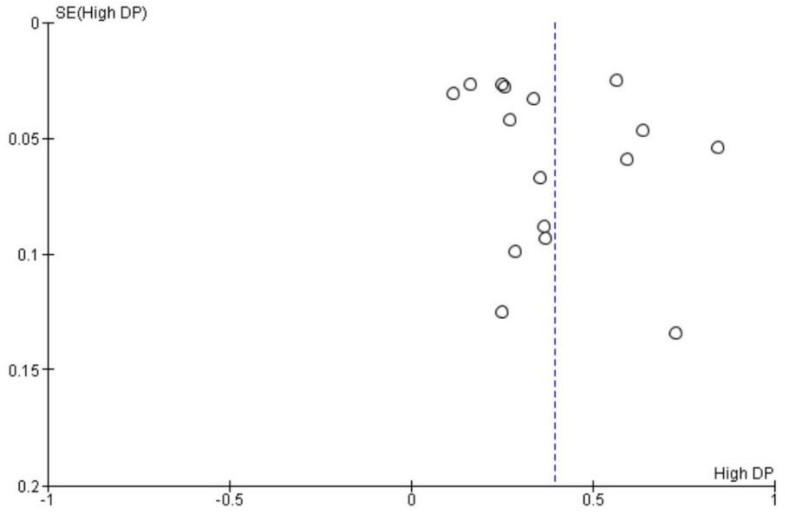

Figure 7: Funnel plot of pooled data for high DP prevalence.

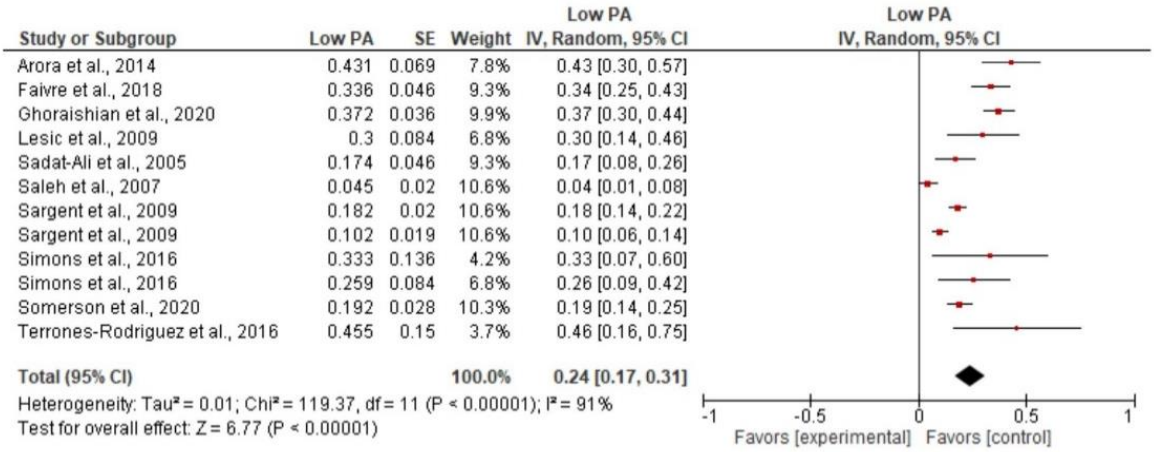

Figure 8: Forest plot of the pooled prevalence of low PA among orthopedic physicians.

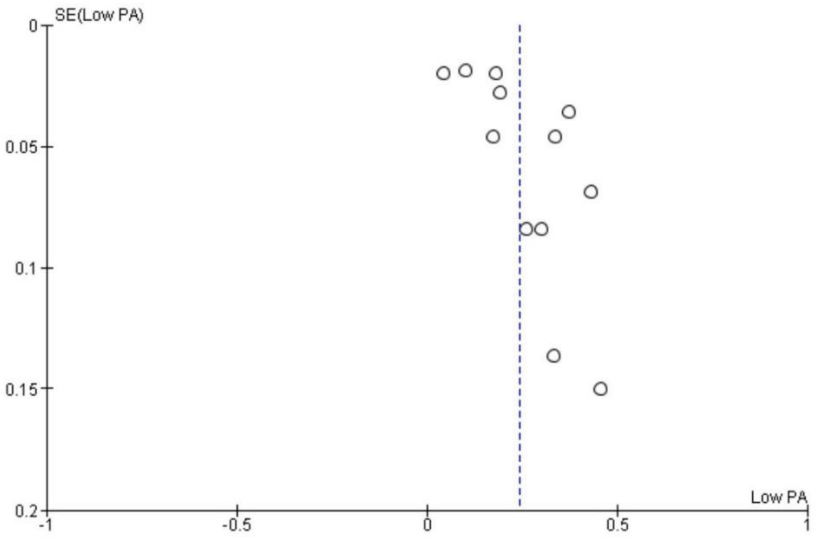

Figure 9: Funnel plot of pooled data for prevalence of low PA.

High EE

The pooled prevalence of high EE was estimated using data from 13 studies and was found to be 34% (95% CI: 27%, 40%) (Figure 4).

The lowest prevalence was reported in a Dutch study by van Vendeloo et al at 16% (95% CI: 9%, 23%), while the highest prevalence was reported by Hwang et al at 76% (95% CI: 63%, 88%).[20,24] The data used in this random-effects meta-analysis were heterogeneous (I^2=88%), and visual inspection of the corresponding funnel plot revealed a symmetrical distribution of the plotted data (Figure 5).

High DP

Based on data pooled from 14 studies, high DP prevalence was estimated to be 39% (95% CI: 29%, 50%) of the studies (Figure 6). Lowest prevalence was reported in a Dutch study by van Vendeloo et al at 11% (95% CI: 5%, 17%), whereas the highest was reported by Hwang et al at 84% (95% CI: 74%, 95%).[20,24] There was significant heterogeneity in pooled data (I^2=96%), and visual inspection of funnel plot revealed symmetrical distribution of plotted data (Figure 7)

Low sense of PA

Based on data pooled from 10 studies, the pooled prevalence of low PA was estimated to be 24% (95% CI: 17%, 31%) (Figure 8).

The lowest prevalence of low PA was reported by Sargent et al at 10% (95% CI: 6%, 14%; out of 264 faculty members), whereas the highest was reported by Terrones-Rodriguez et al at 46% (95% CI: 16%, 75%).[19,29] There was significant heterogeneity in the pooled data (I^2=91%), and visual inspection of funnel plot revealed the symmetrical distribution of the plotted data (Figure 9)

DISCUSSION

Orthopedic surgery involves physical work. In particular, during residency training, surgeons may be required to work long, irregular hours. Such a demanding occupation can result in burnout, which can have negative consequences for both surgeons and their patients. The present meta-analysis included 16 studies that covered a population of 2,564 orthopedic physicians. Quantitative data synthesis revealed that the pooled prevalence of high EE was 34% (95% CI: 27%, 40%), that of high DP was 39% (95% CI: 29%, 50%), that of low PAs was 24% (95% CI: 17%, 31%), and that of overall burnout was 43% (95% CI: 33%, 53%).

Compared to general public, doctors and other healthcare professionals are more prone to burnout.[30] According to a US study that used the MBI (n=7,288), doctors show a higher rate of burnout (38%) than general US population (28%), with frontline medical professionals in the fields of family medicine, general internal medicine, and emergency medicine experiencing the highest rates of burnout.[31] Work overload, perceived lack of control, perceived inadequacy of compensation, perceived lack of community, perceived unfairness, and contradictory ideals are among the factors linked to employee burnout. Burnout is linked to poor health, including headaches, sleep difficulties, hypertension, anxiety, alcoholism, myocardial infarction, physical and mental illness, drug misuse, and low doctor satisfaction.[32] In particular, doctor burnout has been determined to be linked to higher turnover, absenteeism, subpar work, and bad sentiments toward institutions.[33]

Some senior orthopedic surgeons (as well as orthopedic trainees) believe that exposure to a high-stress environment is necessary for molding orthopedic trainees into mature orthopedic surgeons; however, there is no evidence supporting the effectiveness of this approach.[34] Such a misguided ideology could increase the risk of burnout among trainees. As trainees are the main point of contact for patients, their high rate of burnout may result in poor service quality and, hence, reduced patient satisfaction.

Saleh et al assessed burnout (using the MBI) among orthopedic department chairs or chiefs (n=110; US), finding that 36% had high EE, 27% had high DP, and 4% had low PA.[28] These findings are consistent with the later data on orthopedic department chairs (n=282; response rate=69%; US), which showed a 38% rate of high EE.

Using the Copenhagen burnout inventory, Benson et al evaluated burnout among 53 and 73 Australian surgical trainees and fellows, respectively, finding that burnout affects 46% of surgeons and that there is an association between burnout and young age.[35] Additionally, Benson et al in a study of younger fellows of the royal Australasian college of surgeons, found that women have higher levels of personal burnout and work-related burnout than their male counterparts (n=1287).[36] In a predominantly male-dominated field, it is important to determine if female orthopedic surgeons show a higher prevalence of burnout than their male counterparts.

The lowest rates of burnout were reported in a Dutch study by van Vendeloo et al while the highest rates of burnout were reported by a study conducted in China.[20,21] This contrast may be due to different levels of stress in the work environment. Burnout among orthopedic surgeons has been compared to other surgical specialties and associated healthcare personnel. According to Shanafelt et al orthopedic surgeons are among the top five professions with the highest burnout rates in the USA, reporting a burnout percentage of 50%.[31]

CONCLUSION

Burnout is highly prevalent among orthopedic surgeons, with marked variability in data across different countries and study groups. The development of preventive

measures may be necessary to alleviate the high rates of burnout among orthopedic surgeons.

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