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Burnout among surgeons and surgical trainees: A systematic review and meta-analysis of the prevalence and associated factors

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ABSTRACT

Introduction: The more effort is put into work, the greater the chances of burnout. This is common among surgical personnel. We carried out this review study to determine the overall and per-specialty prevalence of burnout, and to identify the factors that affect burnout positively and negatively.

Methods: All full-text articles reporting data related to burnout in surgery and surgical subspecialties using the Maslach Burnout Inventory (MBI) were included. The following bibliographic databases were searched PubMed, Embase and Google Scholar (First 500 pages). We extracted data on the characteristics of the articles including the burnout prevalence and factors.

Results: 27 articles met the criteria. The studies involved 8617 surgeons cutting acrossvarious surgical specialties. The overall prevalence was 47%. The rate per specialty ranged between 15% and 77% with Ear, Nose and Throat (ENT) surgeons having the highest rates. Associated factors included work-related issues and poor work/life balance while protective factors included career advancement, increase in postgraduate years, and having good relationships with co-residents. Our findings are similar to findings from other studies; ENT is seen to have the highest burnout rate while pediatric surgery the lowest.

Conclusion: The high prevalence of burnout among surgeons is concerning and the identified factors responsible should be explored by surgeons, hospital management boards, training colleges, and all bodies concerned to see how it can be reduced.

Abbreviations

MBI	Maslach Burnout Inventory
WHO	World Health Organization
BS	Burnout Syndrome
EE	Emotional Exhaustion
DP	Depersonalization
ENT	Ear Nose and Throat

Introduction

Burnout is a condition characterized by mental fatigue, emotional fatigue, and a lack of a sense of personal achievement due to work-related stressors [1]. Due to the ever-increasing demands in clinical productivity, doctors are burdened with long hours of work; they often have to deal with individuals with varying conditions, social stratification, and moods under limited time and resources and this puts them at risk of suffering from burnout. A recent Medscape Physician Lifestyle report published puts burnout rates among various specialties between 37 and 53% [2].

Burnout is associated with a lower personal quality of life, depression, and alcohol misuse and several factors have been seen to be associated with higher levels. Younger age and female sex were associated with high levels of burnout [3]. Those further in training, however, had lower levels of burnout [3]. Surgeons in particular are at an increased risk of burnout due to the different stressors they face when discharging their clinical duties. The prevalence of burnout, however, varies by specialty with some specialties having higher values. Pulcrano et al. [4] in a meta-analysis study, found that pediatric (86% to 96%) and endocrine (96%) surgeons had the highest career satisfaction, whereas a portion of plastic surgeons (33%) and vascular surgeons (64%) were least content and thus were at higher risk of burnout syndrome [4]. Up to 3% of surgeons suffer from extreme forms of burnout [5].

Building on the appraisal of the foundational work by Maslach et al. on burnout in the 1980s [6], researchers have described burnout as a combination of emotional exhaustion, depersonalization, and low

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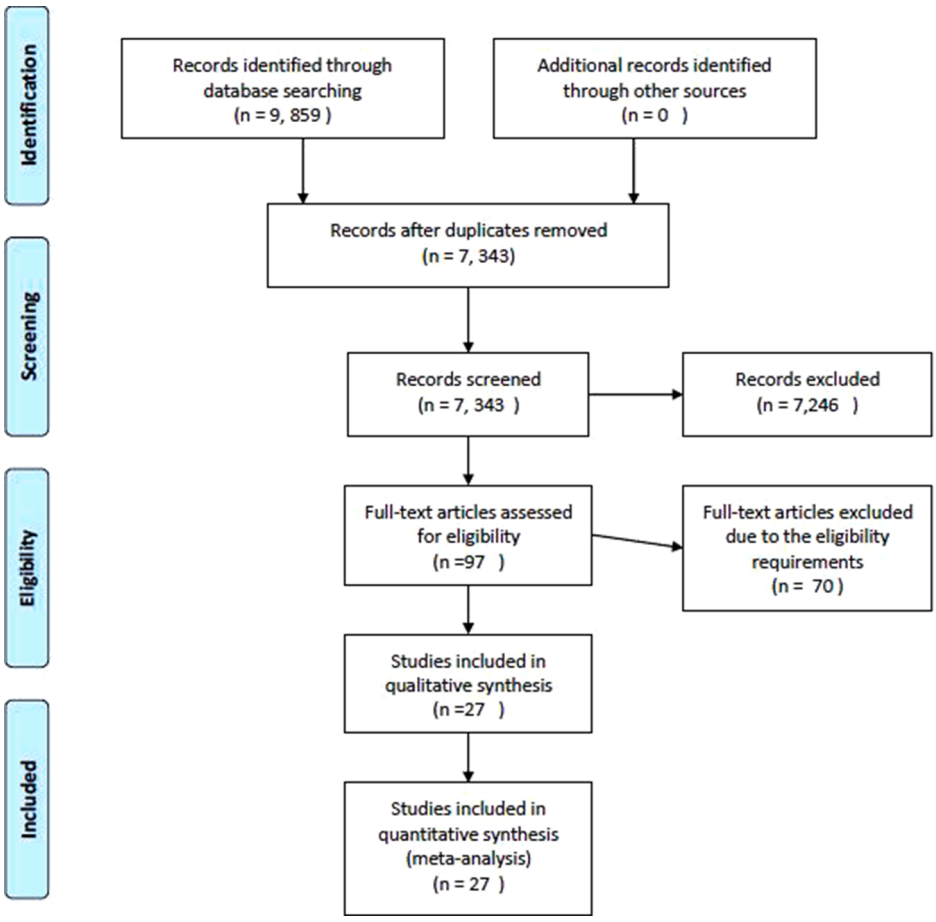

Fig 1. Prisma flow diagram of the study.

personal accomplishment caused by the chronic stress of medical practice [6]. In the literature, burnout is measured by assessing these 3 subcomponents. This is an important tool as it helps to review the estimated burnout prevalence [7]. It is important to recognize burnout as it has been associated with an array of complications such as increased medical errors, [8] and negligence, reduced patient satisfaction, longer convalescence times and decreased professional work ethic [8–10]. Other consequences, including substance abuse, disruptive behavior, absenteeism, attrition, strained personal relationships, divorce, depression, suicidal ideation, and suicide have also been identified [11,12]. This makes it important to identify the prevalence of burnout in surgery and its subspecialties, as well as identifying the factors that affect it.

The importance of recognizing and tackling burnout in surgical practice prompted the authors of this paper to carry out this review study. Here, we aim to determine the overall prevalence of burnout in surgery, the per-subspecialty prevalence, and to identify the factors that affect burnout. We also intend to compare burnout among the different surgical subspecialties.

Materials and methods

Eligibility criteria and quality evaluation

All full-text articles reporting data related to burnout in surgery and surgical subspecialties using the Maslach Burnout Inventory (MBI) or its derivatives were eligible for inclusion. Articles that did not use the MBI as the tool for measuring burnout were excluded. Meta-analyses, reviews, commentary, poster/presentation abstracts were not included. We evaluated the risk of bias per primary study using the Newcastle-Ottawa Quality Assessment Scale (NOS) [13].

Information sources, selection, data charting and the MBI

The following bibliographic databases were searched- PubMed, Embase and Google Scholar (First 500 pages). We used a combination of MeSH terms, keywords, and text words. We focused on terms that included burnout and surgical specialties. The search strategy can be seen in Table B1 in Appendix B. Duplicates were removed and the articles were screened. The titles and abstracts were evaluated independently by three of the authors. We resolved disagreements by consensus. We then screened the full-text articles in detail.

We extracted the data from the eligible articles and used it in this study. The MBI is a validated instrument used to assess burnout and it is composed of three subscales namely emotional exhaustion, depersonalization, and low personal accomplishment. The original instrument is a 22-item questionnaire. There are variants of the MBI, part of which includes the validated abbrievated MBI (aMBI) which is a 9-item questionnaire which assesses the same categories. Burnout is generally said to occur when there are high scores recorded in the EE and/or DP categories with or without a low sense of personal accomplishment. Because of the different methods by which the studies used in this review identified the factors affecting burnout, we could not perform a quantitative analysis. However, we went through each paper and performed a narrative synthesis of the factors each study identified and we discussed them.

Statistical analysis

A random-effects model was used for the meta-analysis. It was carried out with the MetaXL add-on for Microsoft Excel with the use of a double arcsine transformation. A random-effects model was used to account for heterogeneity. We calculated the prevalence for all the studies with a

Table 1
Summary of studies considered in the analysis and burnout rates.

Study	Specialty	Year	Country	Population	Response rate	Burnout rate% (n)	Respondents	% Male	NOS
Malik et al. [14]	Unspecifed	2016	Pakistan	Residents	66.60%	57.9 (77)	133	73.6	7
Burhamah et al. [15]	Across specialties	2021	Kuwait	Residents	N/A	51(43)	85	64.7	7
McAbee et al. [16]	Neurosurgery	2015	United States	Residents and Specialists	24.00%	54.3 (425)	783	83.6	6
Attenello et al. [17]	Neurosurgery	2018	United States	Residents	24.00%	67.1(232)	395	68.4	6
Yu et al. [18]	Neurosurgery	2019	China	Residents and Specialists	N/A	44.51 (535)	1202	92.9	5
Shakir et al. [19]	Neurosurgery	2018	United States	Residents	21.30%	33 (143)	427	N/A	6
Khalafallah et al. [20]	Neurosurgery	2020	United States	Residents	12.20%	26.1 (29)	111	65.8	7
Fargen et al. [21]	Neurosurgery	2019	United States	Specialists	24.00%	55.2(164)	297	N/A	6
Kassam et al. [22]	Transplant surgery	2020	United States	Specialists	59.20%	22.7 (17)	84	59.5	8
liaqat et al. [23]	pediatric surgery	2019	Pakistan	Specialists	36.60%	15 (6)	41	82.9	7
Aldrees et al. [24]	Plastic surgery	2017	Saudi Arabia	Residents	60.00%	47 (18)	38	73.7	6
van der walta et al. [25]	anesthesia	2015	South Africa	Residents and Specialists	66.80%	21 (26)	124	44.4	6
hyman et al. [26]	anesthesia	2017	United States	Residents	76.90%	15 (25)	170	74.1	8
O'kelly et al. [27]	Urology	2015	Ireland and UK	Specialist	42.00%	52 (299)	575	87.5	7
Chan et al. [28]	Urology	2018	Canada	Specialists	17.20%	31.8 (33)	105	N/A	7
Yost et al. [29]	Ear, Nose and Throat Surgery	2014	United States	Residents	47.00%	77 (37)	48	66.7	6
Faivre et al. [30]	Orthopaedics	2018	France	Residents	22.00%	72 (77)	107	65.4	7
Lichstein et al. [31]	Orthopaedics	2009	United States	Residents	58.00%	52 (342)	661	83.3	7
Faivre et al. [32]	Orthopaedics	2019	France	Specialists	23.00%	49.6 (219)	441	93.6	7
Ho et al. [33]	Orthopaedics	2021	Singapore	Residents	100.00%	45.5 (20)	44	N/A	7
Coker et al. [34]	Orthopaedics	2012	Nigeria	Specialist and Residents	N/A	51.7 (15)	29	96.6	5
Celik et al. [35]	General Surgery	2019	Turkey	Specialists	16.10%	69.1 (425)	615	88.3	7
Elmore et al. [36]	General Surgery	2014	United States	Residents	N/A	69 (520)	753	56.4	7
Alotaibi et al. [37]	Ophthalmology	2018	Saudi Arabia	Residents	70.00%	41 (48)	117	53.9	7
Feng et al. [38]	Ophthalmology	2017	United States	Residents	23.00%	63.30 (169)	267	53.2	7
Helewa et al. [39]	Acute care surgery	2012	Canada	Residents	76.00%	61 (12)	19	94.7	7
Coleman et al. [40]	Vascular Surgery	2020	United States	Specialists and Residents	34.30%	41.3 (360)	889	N/A	7

95% CI. We also calculated the prevalence per specialty where more than one specialty-specific study was identified. We conducted a single-study exclusion sensitivity analysis to see if there was any single study that any study that had a significant effect on the heterogeneity and cumulative-study exclusion sensitivity analysis by including only studies that had scores of 7 and above on the NOS scale (high quality studies). We conducted a subgroup analysis of studies who had a high response rate (50% of more) as against a subgroup of studies who had low response rate.

Results

Prisma flowchart

The PRISMA chart is shown in Fig 1. Only 7343 studies remained after duplicates were removed. 7, 246 studies were excluded after the title and abstracts were screened, and 70 more studies were excluded after reading the full text and assessing them as against the eligibility criteria (10 were only abstracts, 20 studies included interns, nurses, 21 studies did not use the Maslach Burnout Inventory and 19 did not identify the overall burnout rates). 27 articles met the criteria in full and were used in this review (Table 1).

NOS evaluation

The selected studies for this review were submitted to the Newcastle Ottawa Scale evaluation to determine the risk of bias. The studies are seen in Table 1. Two of the studies scored 8, [22,26], while 16 studies scored a total of 7 on the scale [14,15,20,23,27,28,30–33,35–40]. Six of the selected studies scored 6 [16, 17, 19, 21, 25, 29], whereas two studies had a score of 5 after assessment [18, 34].

The overall prevalence of burnout in surgery

The 27 included studies involved about 8617 surgeons and resident (Table 1). Of the 8617 surgeons, 4316 of them met the criteria for burnout (Table 1). With the random-effects model, the overall general prevalence of burnout was estimated to be 47% (Fig 2).

Prevalence of burnout per surgical specialty

The prevalence of burnout in each specialty can be seen in Table 2. The rate of burnout per specialty ranged between 15% and 77%. The highest prevalence of burnout can be seen in the ENT surgical specialty, with a prevalence of 77%, followed by General surgery with 69%. The lowest burnout rates were seen in pediatric surgery and anesthesiology with values of 15% and 17.5% respectively.

Factors associated with burnout

The factors positively associated with burnout across the different studies include; being accused of malpractice, occupational stressors, low annual income, workplace violence, frustrating colleagues, insufficient study time, and poor work/life balance which included long working hours, on-call duties, a lack of extracurricular activities and added clinical responsibilities after work. Other identified factors include; male gender, social media, poor support, uncertainty, family-related issues, specializing, private practice, young age in years and/or practice, poor sleep, and disruptions due to Covid-19 [14,18, 23, 26, 29, 30, 35, 38, 47, 48]. The most common protective factor was work-related, which included reasons like academic affiliations, being challenged at work, participation in research, and having a good relationship with co-residents. Next were specialty-related reasons like career advancement and an increase in postgraduate years. Being aware

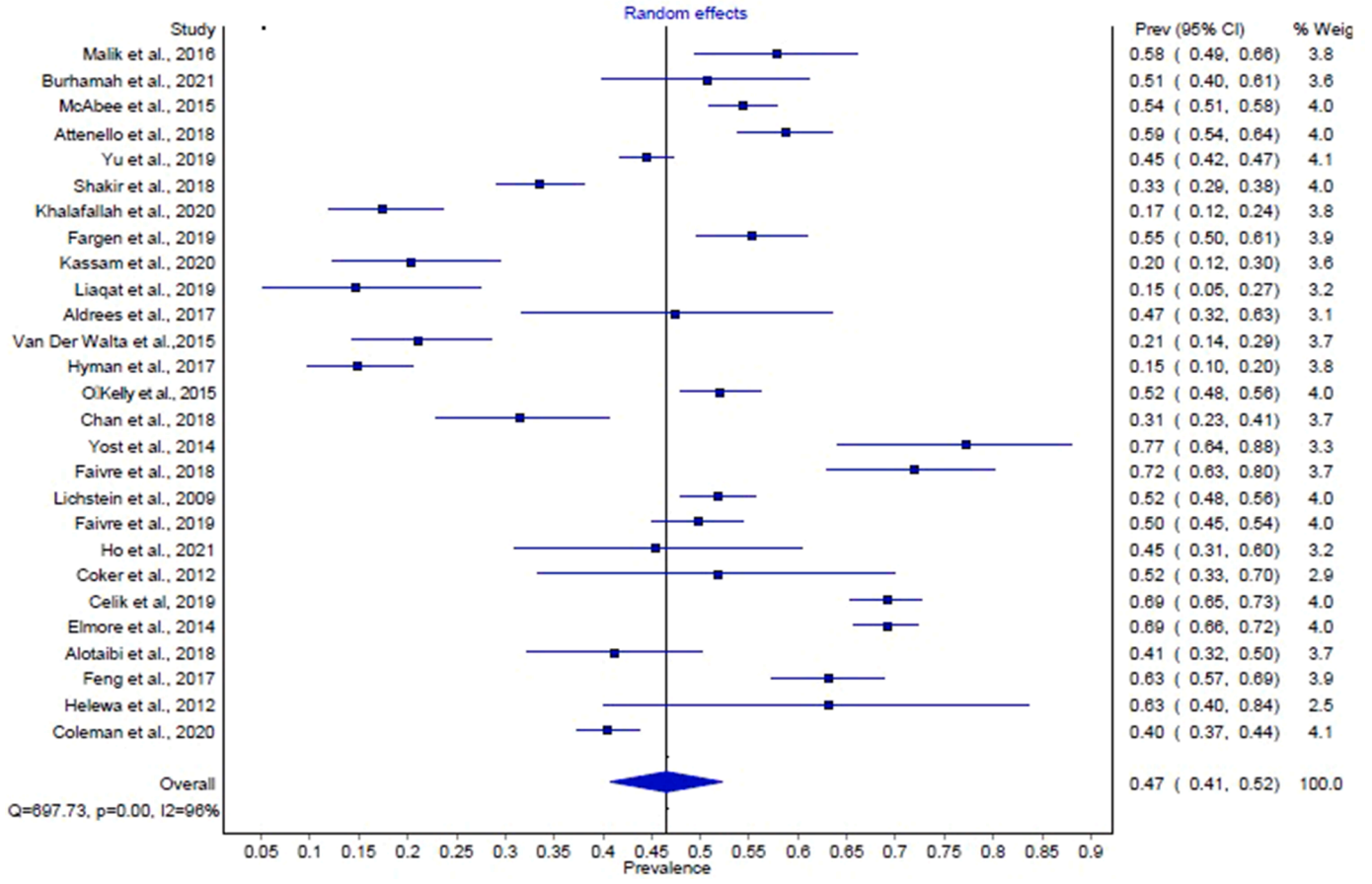

Fig 2. Forest plot showing the overall prevalence of burnout in surgery.

Table 2
Burnout prevalence per specialty.

Specialty	Study names	Prevalence
Across specialties	Malik et al.,2016, Burhamah et al., 2012	55%
Neurosurgery	McAbee et al.,2015, Attenello et al.,2018, Yu et al.,2019, Shakir et al.,2018, Khalafallah et al.,2020 Fargen et al.,2019	44%
Transplant surgery	Kassam et al.,2020	22.7%
Pediatric surgery	Liaquat et al.,2019	15%
Plastic surgery	Aldrees et al.,2017	47%
Anaesthesiology	Van der Walta et al.,2015, Hyman et al.,2017	17.5%
Urology	O'kelly et al.,2015, Chan et al.,2018	41.7%
ENT	Yost et al.,2014	77%
Orthopaedics	Lichstein et al.,2009, Ho et al.,2021, Faivre et al.,2018, Faivre et al.,2019, Coker et al.,2012	54.6%
General surgery	Celik et al.,2019, Elmore et al.,2014	69%
Ophthalmology	Alotaibi et al.,2018, Feng et al., 2017	52.5%
Acute care surgery	Helewa et al.,2012	61%
Vascular	Coleman et al.,2020	41.3%

of burnout as well as exercise had protective effects. Older age of practice also had protective benefits [42,49, 50].

Sensitivity and subgroup analysis

The single-study exclusion sensitivity analysis conducted showed that there was no study that had a significant effect on heterogeneity. The cumulative-study exclusion sensitivity analysis which involved the studies which were high quality with the NOS scale gave an overall burnout prevalence of 45% (Fig 3.). The subgroup analysis of studies based on the response rates (high vs low) showed some difference (39% x 49%) (Fig 4, Fig 5).

Discussion

The overall prevalence of burnout and peculiarities per surgical specialty

Our findings revealed that the overall prevalence of burnout among surgeons and residents is 47%. This is similar to the results of a recent meta-analysis done by Low et al. [41] which places the aggregate prevalence of burnout among surgical residents at 53.27%. Another study, done by Balendran et al. [42] which examined burnout among surgical specialties in the United Kingdom, revealed a much lower overall burnout rate of 32%. This could be because the rate was calculated as a simple median of the individual burnout rates identified in the ten papers involved in the meta-analysis. From the studies compared in this meta-analysis, osteopathic ENT is seen to have the highest burnout rate of 77%. This may be largely due to the small sample size used in the parent research. However, this is not very dissimilar to research done in Australia where 73% of Otolaryngology-Head and Neck Surgery Trainees had a burnout in at least 1 of the 3 MBI domains [43]. This is possibly due to the competitive nature of the ENT [44]. Pediatric surgery, however, has the lowest burnout rate with a figure of 15%. Other studies reviewed also showed low burnout rates in this subspecialty, for example, a study done in the United States showed burnout among pediatric surgeons to be 24% [45]. The reason for the low burnout rates in pediatric surgery is unclear. More studies on burnout in pediatric surgery are needed to be able to establish a consistent finding.

Factors associated with burnout

Several factors that increase burnout syndrome among doctors were identified across the selected studies. The factors identified include male gender, marital status, poor sleeping habit, malpractice lawsuits and

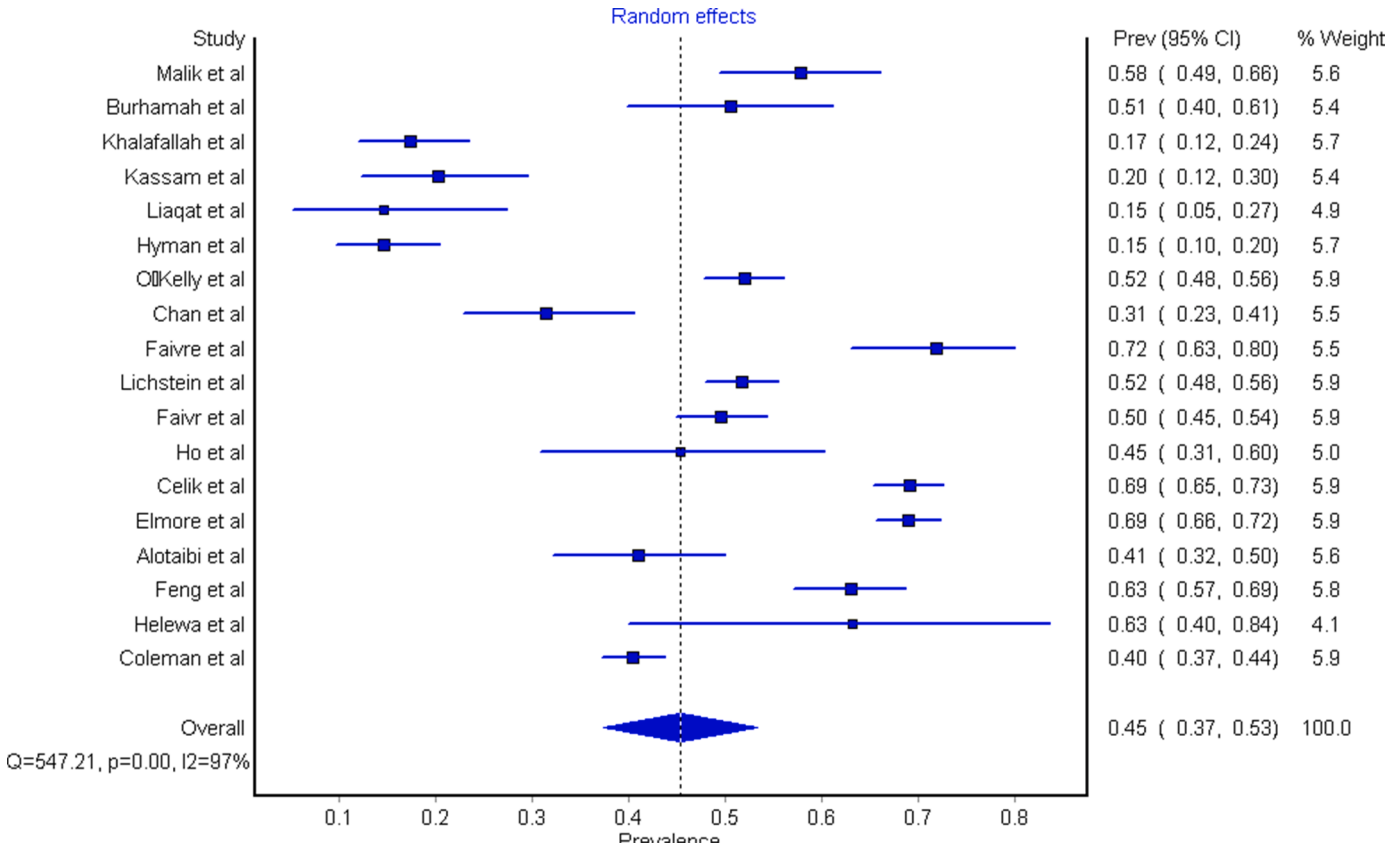

Fig 3. Forest plot showing the single-study exclusion sensitivity analysis involving high-quality studies (NOS scale).

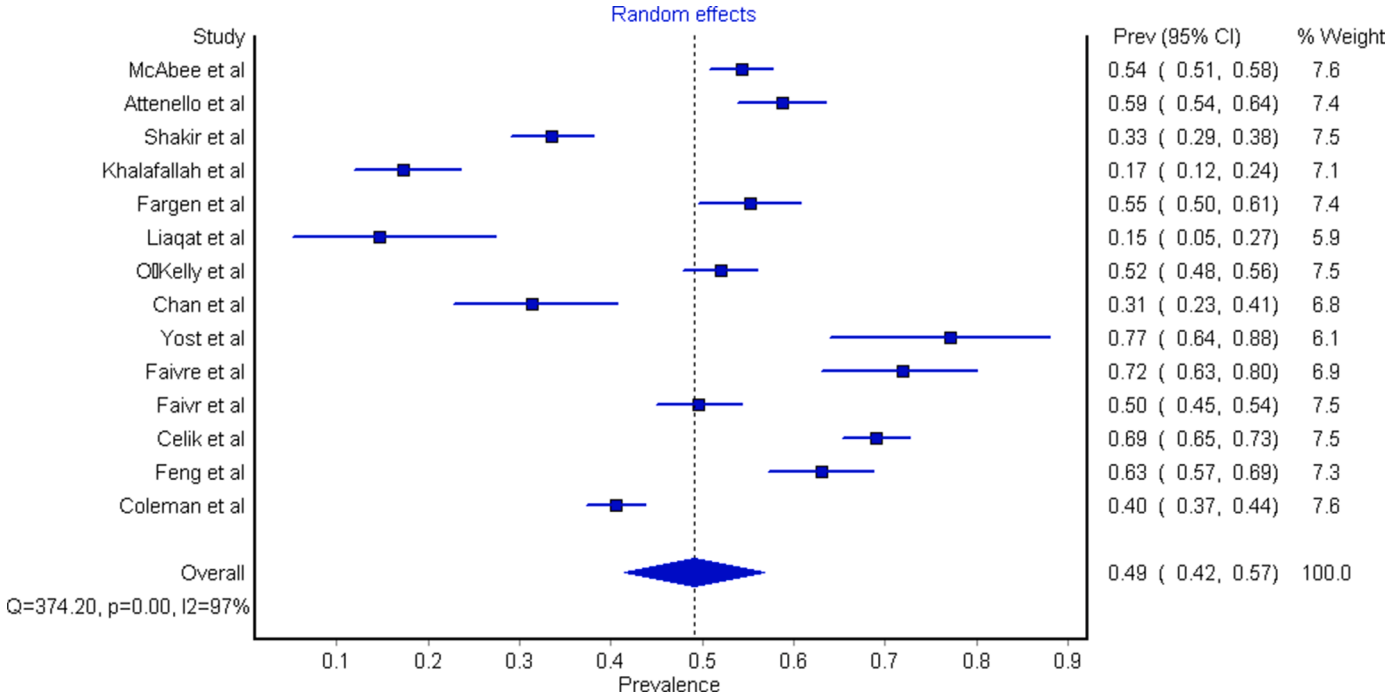

Fig 4. Forest plot showing the subgroup analysis of studies based on the response rates (high).

lesser years in practice [14,18, 23, 26, 29, 30, 35, 38, 47, 48]. Male gender was associated with a higher risk of burnout as identified by 2 of the selected studies [14, 26]. This is in contrast to the result obtained from another systematic review which showed the female gender to be associated with a higher risk of burnout [3]. In terms of marital status, there was no consensus on how this contributes to burnout as different studies showed different outcomes. While some concluded that singleness and childlessness could increase burnout, others showed marriage could also do the same [18, 23, 30].

Poor sleeping habits and malpractice lawsuits have been seen to be

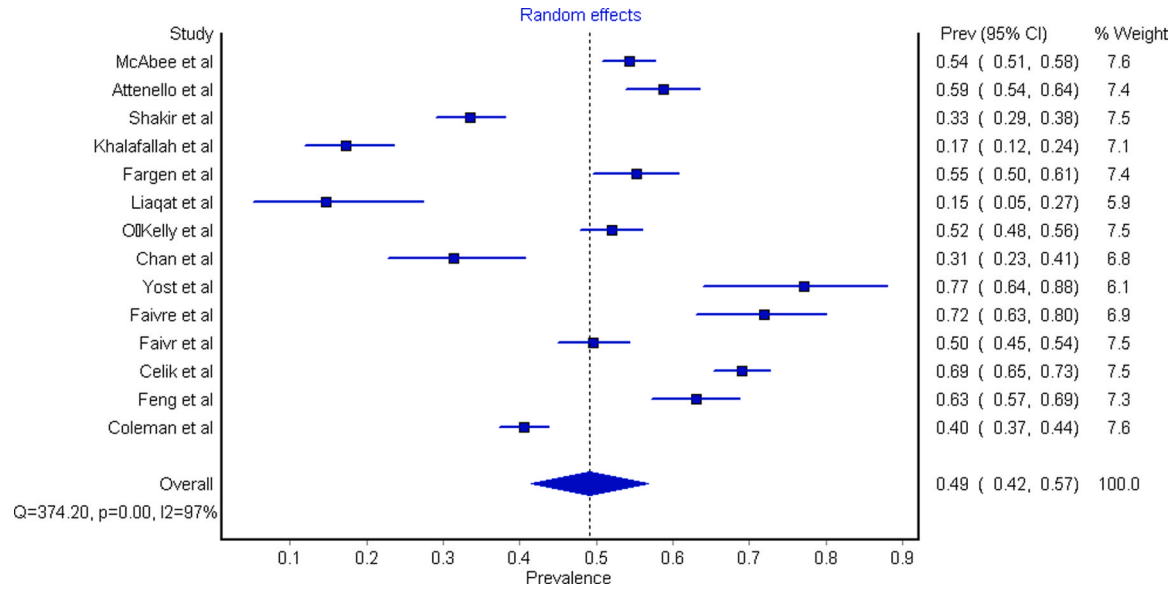

Fig 5. Forest plot showing the subgroup analysis of studies based on the response rates (low).

associated with burnout [35,46]. Surgeons who had spent lesser time in practice were seen to have higher rates of burnout in comparison to their older counterparts. [3,47]. Occupational stressors such as excessive administrative tasks and insufficient administrative support, high patient load, long working hours, are also factors that have been correlated with surgeons' burnout [47,48]. This review also identified some protective factors associated with burnout among surgical specialties. These include academic affiliations, being challenged at work, participation in research, having a good relationship with co-residents, career advancement, increase in postgraduate years and exercise [42,49,50]. Kumar S. et al. [50] showed that a healthy relationship among surgical co-residents and surgeons and nurses was associated with a lower risk of burnout in surgeons [35].

Study limitations and weaknesses

Despite our attempt at a comprehensive review, we believe this study has several limitations. Because we limited our inclusion to studies that were only available in the English language, we could have potentially missed some important articles. In an attempt to capture burnout across surgical specialties, we were only able to identify one or two studies that fit our eligibility criteria in some specialties like ear nose and throat surgery while we found an abundance of papers related to burnout in neurosurgery. Another limitation was the measurement of burnout. Many of the studies identified the factors affecting burnout with different methods, as such we could not perform a quantitative analysis. We undertook a narrative synthesis instead and this approach may have been prone to bias. While we chose the Masclach Burnout Inventory as the validated instrument in our criteria, there were other studies that evaluated burnout with other forms of validated and non-validated instruments. As demonstrated in the analysis, the difference in response rates also serves as a limitation as there is a possibility that most of those who opted to respond to the different surveys were those that were burnout, which could have potentially caused an overestimation of the different prevalences across some of the studies used in this meta-analysis. The heterogeneity of the populations is also an important limitation, as factors responsible for burnout in some first-world countries may not be the same in third-world countries, likewise the difference in burnout between consultants and trainee doctors.

Conclusion

Burnout among surgeons is gaining attention in recent times. As this study has shown, the high prevalence of burnout among surgeons is concerning and the identified factors responsible should be explored by surgeons, hospital management boards, training colleges, and all bodies concerned to see how it can be reduced. The positive effect of reducing burnout on physicians' health and patient outcome has been emphasized in this publication and hopefully, this would trigger action from all and sundry.

Recommendations

While burnout is pervasive, some steps can be taken to reduce the prevalence. Burnout can lead to malpractice and vice versa, leaving the surgeon at the epicenter of a vicious cycle. Generally, taking collective measures against burnout can reduce the rate at which surgeons make mistakes which will ultimately reduce lawsuits. On a more specific basis, hospital management and fellow surgeons should provide more support for doctors with lawsuits. Furthermore, courses or programs could be designed where surgeons are taught how to work under pressure.

Hospital management boards must be particular about reducing stress levels and effective stress management. This could be by ensuring leave periods are not encroached into, enough surgeons are employed to avoid overworking by the engaged surgeons, and that the hardworking nature of surgeons is not abused in any way. The need for mentoring younger surgeons is glaring; surgeons with budding careers should not be left to figure out everything by themselves but are to be shown a better way by older colleagues. Therefore, hospitals and surgical colleges can institute mentorship programs.

Setting up programs and measures to foster good working relationships and creating a better working environment should be at the forefront of the minds of health facilities working towards reducing the effects of surgeon burnout on both their staff and their patients. Education of surgeons on burnout syndrome will be another effective measure in achieving this goal. Given that physical activity was identified as a protective factor, encouraging surgeons to incorporate regular exercise into their schedules may be of added benefits.

Declaration of Competing Interest

The authors declare that they have no competing interests

Authors' contributions

D.J.- Conception, and design of the study, acquisition, and analysis of data, writing - methods and results, visualization, validation, review, and editing. A.N.- Acquisition of Data, analysis of data, writing - methods, and results. C.O -Interpretation of Data, writing -discussion and conclusion. Ch.O.- Interpretation of data, writing -discussion and conclusion. G.A.- Acquisition of data, writing- introduction. K.O.- Acquisition of Data, writing- introduction. I.O.- Acquisition of Data, writing - methods, and results.

All authors contributed to writing the original draft, revising, and the final approval of the submitted version

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Ethics approval and consent to participate

Not applicable

Consent for publication

Not applicable.

Availability of data and materials

The datasets used during the current study are available from the corresponding author on reasonable request.

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Appendix A

Table A1

Table A1
. Maslach burnout inventory burnout subcategories in the eligible studies.

Author	Emotional Exhaustion [n]			Depersonalization [n]			Personal accomplishment [n]		
	High	Moderate	Low	High	Moderate	Low	High	Moderate	Low
Malik et al.,2016	67	44	22	66	34	33	27	35	71
Burhamah et al.,2021	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
McAbee et al.,2015	263	165	322	235	166	349	336	201	312
Attenello et al.,2018	125	66	155	207	64	75	119	78	149
Yu et al.,2019	434	573	195	356	303	543	151	518	533
Shakir et al.,2018	124	179	124	217	138	72	3	64	380
Khalafallah et al.,2020	26	28	57	9	27	75	87	23	1
Fargen et al.,2019	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Kassam et al.,2020	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Liaquat et al.,2019	7	13	20	5	12	23	16	12	12
Aldrees et al.,2017	27	5	6	19	13	6	11	14	13
Van der walta et al.,2015	18	13	55	23	20	43	32	29	25
Hyman et al.,2017	105	43	30	54	63	63	46	60	71
O'kelly et al.,2015	165	148	262	0	135	285	180	163	232
Chan et al.,2018	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Yost et al.,2014	182	160	220	292	124	145	264	171	118
Faivre et al.,2018	28	39	40	68	23	16	30	41	36
Lichstein et al.,2009	228	174	254	299	143	214	379	143	134
Faivre et al.,2019	61	111	268	100	167	174	253	106	82
Ho et al.,2021	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Coker et al.,2012	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Celik et al.,2019	393	84	138	294	97	224	219	169	227
Elmore et al.,2014	57	23	20	50	29	21	16	37	46
Alotaibi et al.,2018	44	41	32	20	36	61	37	39	41
Feng et al.,2017	146	76	35	124	66	77	189	47	31
Helewa et al.,2012	6	6	6	4	7	7	9	4	5
Coleman et al.,2020	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Appendix B

Table A2

Table B1
. Search strategy.

KEYWORDS/MeSH terms	DATABASE	RESULTS (Articles)
(Burnout) AND (Surgery)	PubMed	1336
(Burnout) AND (Neurosurgery)	PubMed	140
(Burnout) AND (Transplant Surgery)	PubMed	68
(Burnout) AND (Paediatric Surgery)	PubMed	136
(Burnout) AND (Cardiothoracic Surgery)	PubMed	29
(Burnout) AND (Plastic Surgery)	PubMed	94
(Burnout) AND (Anaesthesia)	PubMed	238
(Burnout) AND (Urology)	PubMed	135
(Burnout) AND (ENT)	PubMed	18
(Burnout) AND (Orthopaedics)	PubMed	245
(Burnout) AND (General Surgery)	PubMed	490
(Burnout) AND (Ophthalmology)	PubMed	67
(Burnout) AND (Acute Care Surgery)	PubMed	39
(Burnout) AND (Vascular Surgery)	PubMed	68
'Burnout Surgery'	First 500 pages	5000
(Burnout* AND Surgery).mp.	Embase	1106
(Burnout* AND Neurosurgery).mp.	Embase	119
(Burnout* AND Transplant surgery).mp.	Embase	6
(Burnout* AND Paediatric surgery).mp.	Embase	1
(Burnout* AND Plastic Surgery).mp.	Embase	58
(Burnout* AND Vascular Surgery).mp.	Embase	47
'Burnout Anaesthesia'	Embase	73
(Burnout* AND Urology).mp.	Embase	23
(Burnout* AND ENT).mp.	Embase	13
(Burnout* AND Orthopaedics).mp.	Embase	23
(Burnout* AND General Surgery).mp.	Embase	234
(Burnout* AND Ophthalmology).mp.	Embase	49
'Burnout Acute Care Surgery'	Embase	4

Appendix C

Study distribution

Of the 27 studies, 12 of them, which represented the majority, were from the United States. The countries represented in this review include Pakistan (2), Kuwait (1), China (1), Saudi Arabia (2), South Africa (1), United Kingdom(1), Canada (2), France (1), Singapore (1), Nigeria (1), Turkey (1) (Fig 2).

Fig C1

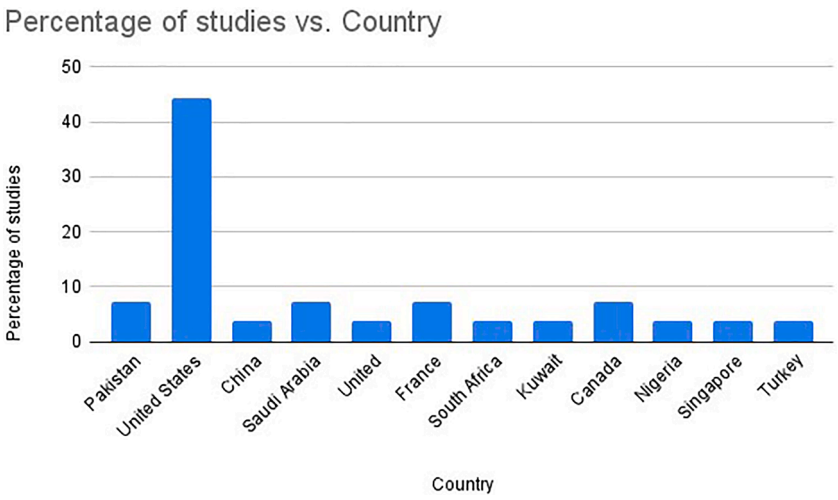

Fig C1. The geographical spread of studies included in the study.

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