



# Factors associated with risk of burnout in neurosurgeons: current status and risk factors

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## Abstract

**Objective** The study aimed to evaluate burnout and associated risk factors in neurosurgical residents and faculty members.

**Summary of background data** Burnout is an occupational risk of emotional exhaustion, depersonalization, and reduced perception of personal accomplishment secondary to work stress. It burdens the individual with immense mental stress causing compromised professional performance. Healthcare workers, particularly surgeons, have been documented to be at high risk of developing burnout, considering the stressful routine and serious impact of their profession.

**Methods** The modified Maslach Burnout Inventory was filled by fellow neurosurgical residents or consultants. The respondents were classified into burnout and non-burnout groups and then analyzed for the associated risk factors. The data were analyzed using SPSS v26.

**Results** One hundred and thirty-eight neurosurgical healthcare workers, including 62 residents and 76 consultants, responded to the questionnaire. The burnout and non-burnout groups comprised 83 (60%) and 55 (39.9%) respondents. Female gender and few kids were observed as significant risk factors for the development of burnout ( $p = 0.013$  and  $p = 0.006$ , respectively). Regardless of its year, residency was a risk factor for overall burnout, as well as in each subsection of the Maslach Inventory ( $p = 0.002$ ). In consultants, recent qualifications and a high number of weekly calls were also associated with a significant risk of burnout ( $p = 0.012$  and  $p = 0.027$ , respectively). Marital status and national economic status did not reveal any influence on the status of burnout in neurosurgical healthcare workers.

**Conclusion** Burnout syndrome is a prevalent and serious, yet overlooked, condition among neurosurgeons. Adequate assessment and steps should be encouraged to ensure physician and patient safety.

**Keywords** Burnout · Neurosurgery · Stress · Mental stress · Work stress

## Introduction

Burnout is commonly described as emotional exhaustion, depersonalization, and reduced perception of personal accomplishment secondary to work-related stress [1–3]. It causes personal mental stress contributing to poor performance at the job.

Its prevalence in healthcare workers has been widely reported and remains a grave concern due to the higher risk of compromised quality of care [1, 4, 5]. Studies have associated burnout syndrome with medical errors, early retirement, more medicolegal cases, and diminished satisfaction [3, 6–8].

Neurosurgical healthcare workers can also be at risk of high burnout, attributed to their mental and physical demands and the extended training duration [9]. The literature reports burnout to be widely present in neurosurgeons [10, 11]. Our study aimed to assess the factors contributing to the presence of personal burnout in neurosurgical residents and consultants.

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## Methods

A study was conducted at the Dow University Hospital Ojha Campus from January to August 2021. The Maslach Burnout Inventory was used to assess the presence of burnout in neurosurgical residents or consultants. The questionnaire has three subsets, emotional exhaustion, depersonalization, and lack of personal accomplishment. Before distributing the questionnaire, a pilot study was conducted locally among surgical colleagues not related to neurosurgery. The pilot study allowed us to modify the standard Maslach Burnout Inventory questionnaire by excluding the option 'Every Week', which scored 4, as the participants were confused with other overlapping options. Subsequently, any question was then either scored 3 or 5 by the participant.

We divided the respondents into burnout and non-burnout groups. The burnout group was defined as having a high burnout level in at least one of the three subsets of the Maslach Burnout Inventory questionnaire. Scores of  $\geq 27$ ,  $\geq 10$ , and  $\leq 33$  were high burnout levels for emotional exhaustion, depersonalization, and personal accomplishment subsets.

## Analysis

The collected data were analyzed in SPSS v26. Categorical data were presented as frequency and percentages, whereas continuous data were described as mean and standard deviation. Both groups were compared with respect to their outcomes.

## Results

One hundred and thirty-eight neurosurgical healthcare workers, including 62 residents and 76 consultants, responded to the questionnaire. The criteria allocated 83 (60.1%) of the total respondents to the burnout group, including 71 (56.8%) males and 12 (92.3%) females, whereas 55 (39.9%) respondents to the non-burnout group, including 54 (43.2%) males and 1 (7.7%) female. Significantly more females were found to suffer burnout than men, as 12 (92.3%) of the enrolled females belonged to the burnout group ( $p=0.013$ ) as observed in Table 1 and Fig. 1.

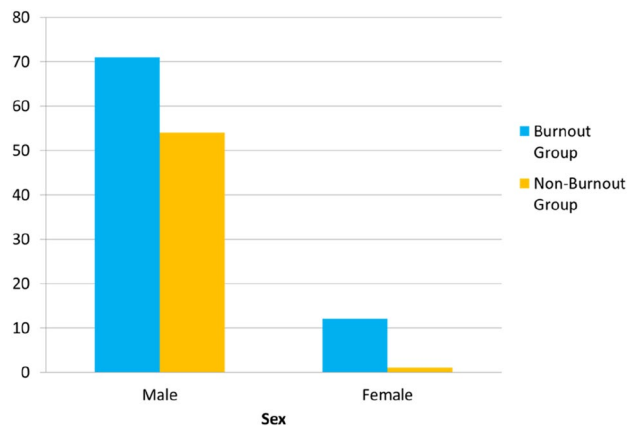
Similarly, residents were significantly more prone to burnout than consultants (46 (74.2%) vs 37 (48.7%), respectively,  $p = 0.002$ ) as observed in Fig. 2. The number

**Table 1** Characteristics of the respondents in each group

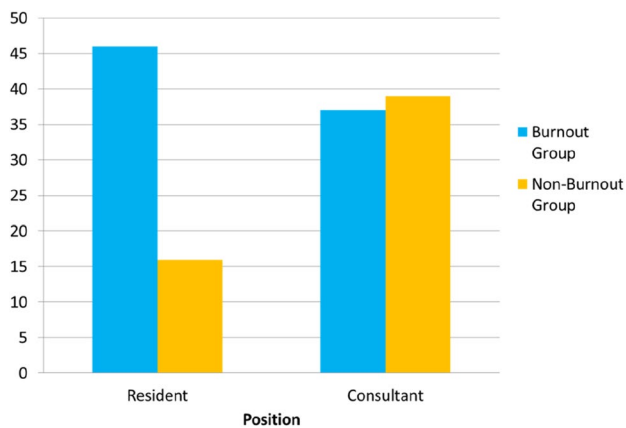
Characteristics	<i>N</i>	Burnout group <i>n</i> (%)	Non-burnout group <i>n</i> (%)	<i>p</i> value
<b>Sex</b>				
Male	125	71 (56.8)	54 (43.2)	0.013
Female	13	12 (92.3)	1 (7.7)	
<b>Marital status</b>				
Single	32	22 (68.8)	10 (31.3)	0.280
Married	105	61 (58.1)	44 (41.9)	
<b>Position</b>				
Resident	62	46 (74.2)	16 (25.8)	0.002
Consultant	76	37 (48.7)	39 (51.3)	
<b>Country</b>				
LMIC	108	61 (56.5)	47 (43.5)	0.235
HIC	26	18 (69.2)	8 (30.8)	
<b>Number of kids</b>				
0	38	27 (71.1)	11 (28.9)	0.006
1	29	19 (65.5)	10 (34.5)	
2	38	19 (50.0)	19 (50.0)	
3	15	6 (40.0)	9 (60.0)	
4	4	1 (25.0)	3 (75.0)	
<b>Year of residency</b>				
1	5	4 (80.0)	1 (20.0)	0.572
2	10	9 (90.0)	1 (10.0)	
3	13	8 (61.5)	5 (38.5)	
4	13	9 (69.2)	4 (30.8)	
5	23	17 (73.9)	6 (26.1)	
Time since consultant (years) <sup>a</sup>	8.64 ± 8.56	6.08 ± 6.86	11.28 ± 9.39	0.012
<b>Number of calls per week<sup>a</sup></b>				
Resident	2.39 ± 0.74	2.42 ± 0.69	2.31 ± 0.87	0.607
Consultant	2.46 ± 0.73	2.26 ± 0.82	2.65 ± 0.59	0.027

LMIC low- to middle-income countries, HIC high-income countries

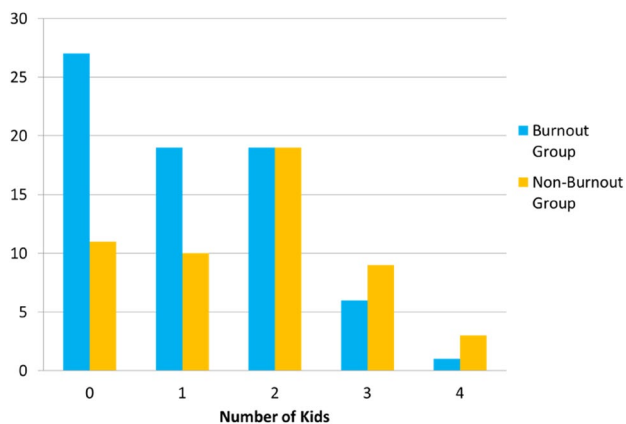
<sup>a</sup>Mean (s.d.)



**Fig. 1** Distribution of sex in each group



**Fig. 2** Distribution of position in each group



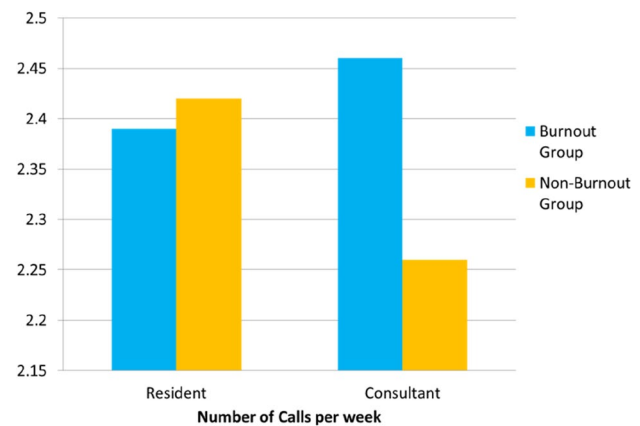
**Fig. 3** Number of kids of the respondents in each group

of kids of the respondents ranged from 0 to 4, with the risk of burnout decreasing significantly as the number of kids increased ( $p = 0.006$ ) as seen in Fig. 3. Marital status and national economic status did not reveal any influence on the status of burnout on neurosurgical healthcare workers.

The mean number of calls per week for consultants was significantly lower in the burnout group than the non-burnout group ( $2.26 \pm 0.82$  vs  $2.65 \pm 0.59$  respectively,  $p = 0.027$ ) as observed in Fig. 4. However, the difference in the mean number of calls per week for the residents was inconclusive ( $p > 0.05$ ).

The year of residency was not a significant factor for burnout in the residents. However, the time since practicing as a consultant was a significant contributor to burnout in consultants. The recently qualified consultants were more likely to suffer burnout, as the burnout group had a considerably lower time since practicing as a consultant ( $6.08 \pm 6.86$  vs  $11.28 \pm 9.39$  years, respectively,  $p = 0.012$ ).

Subgroup analysis of the Maslach Burnout Inventory sections can be observed in Table 2. No measured factor, except



**Fig. 4** Number of weekly calls of the respondents in each group

employment position, influenced the emotional burnout of the neurosurgeons. The residents, compared to surgeons, were more likely to develop emotional burnout (34 (54.8%) vs 22 (28.2%), respectively,  $p = 0.001$ ).

Depersonalization burnout was more common in females when compared to men (10 (71.4%) vs 50 (40.3%), respectively,  $p = 0.026$ ). The residents were also at a higher risk for depersonalization burnout than the consultants (34 (55.7%) vs 26 (33.8%), respectively,  $p = 0.010$ ). No other factors significantly contributed to it.

Similarly, lack of personal accomplishment was also significantly more commonly felt in the residents than the consultants (23 (41.4%) vs 17 (22.4%), respectively,  $p = 0.021$ ). All other factors played a limited role in its development in neurosurgeons.

## Discussion

Physicians are at a higher risk for burnout syndrome than the general population [12, 13]. Neurosurgeons remain vulnerable to the syndrome due to their stressful routine and serious responsibilities concerning patient care. Maslach Burnout Inventory is a set of questions that have been widely used in the literature to assess individual burnout.

More than half of our respondents were suffering from burnout. Our study showed the prevalence of burnout slightly higher than the available literature, which observed 27–57% [10, 11]. Females were more vulnerable to burnout than males. However, it should also be noted that they compromised only 9.4% of the total respondents. In addition, females were more vulnerable to depersonalization burnout than men. A recent study by Baumgarten et al. revealed no significant difference in burnout between genders in his sample, which constituted 26.6% females [14]. Another study by Yu et al. also did not observe

**Table 2** Characteristics of the respondents for each subscale of the Maslach Burnout Inventory

Characteristics	Burnout on emotional subscale		Burnout on depersonalization subscale		Burnout on personal accomplishment subscale				
	N	n (%)	p value	N	n (%)	p value	N	n (%)	p value
<b>Sex</b>									
Male	126	50 (39.7)	0.818	124	50 (40.3)	0.026	120	37 (30.8)	0.675
Female	14	6 (42.9)		14	10 (71.4)		12	3 (25.0)	
<b>Marital status</b>									
Single	32	13 (40.6)	0.995	32	18 (56.3)	0.114	30	11 (36.7)	0.406
Married	106	43 (40.6)		104	42 (40.4)		101	29 (28.7)	
<b>Position</b>									
Resident	62	34 (54.8)	0.001	61	34 (55.7)	0.010	56	23 (41.1)	0.021
Consultant	78	22 (28.2)		77	26 (33.8)		76	17 (22.4)	
<b>Country</b>									
LMIC	110	43 (39.1)	0.953	108	41 (38.0)	0.067	105	29 (27.6)	0.225
HIC	26	10 (38.5)		26	15 (57.7)		25	10 (40.0)	
<b>Number of kids</b>									
0	38	20 (52.6)	0.698	38	19 (50.0)	0.764	35	14 (40.0)	0.673
1	30	12 (40.0)		29	12 (41.4)		28	9 (32.1)	
2	39	13 (33.3)		38	13 (34.2)		36	9 (25.0)	
3	15	4 (26.7)		15	5 (33.3)		15	3 (20.0)	
4	4	1 (25.0)		4	1 (25.0)		4	0 (0)	
<b>Year of residency</b>									
1	5	3 (60.0)	0.658	5	4 (80.0)	0.899	5	1 (20.0)	0.934
2	10	6 (60.0)		10	5 (50.0)		10	6 (60.0)	
3	13	7 (53.8)		12	5 (41.7)		12	5 (41.7)	
4	13	7 (53.8)		13	8 (61.5)		12	4 (33.3)	
5	23	12 (52.2)		23	13 (56.5)		19	8 (42.1)	
Time since consultant (years) <sup>a</sup>	24	5.96 ± 7.58	0.067	27	6.59 ± 7.90	0.107	19	7.95 ± 8.49	0.682
<b>Number of calls per week<sup>a</sup></b>									
Resident	33	2.42 ± 0.75	0.721	34	2.47 ± 0.71	0.295	23	2.39 ± 0.58	0.699
Consultant	21	2.29 ± 0.85	0.200	25	2.28 ± 0.84	0.134	17	2.35 ± 0.70	0.495

LMIC low- to middle-income countries, HIC high-income countries

<sup>a</sup>Mean (s.d.)

similar burnout prevalence based on gender, although females constituted only 7.1% of its total sample [15]. The low feminine percentages in the studies can correspond to a few female neurosurgeons in the field.

Burnout syndrome was more prevalent in the residents compared to the consultants. The higher burnout in residents can be attributed to their unstable routine work, long duty hours, and stress of learning during the job [3, 16–18]. Literature widely documents the high prevalence of burnout during residency and recommends regular assessment and strategies to reduce its risk [2, 3, 11, 14, 19, 20]. Our study also observed that the residents were vulnerable to high burnout levels in all three subsets of the Maslach Burnout Inventory. This expresses grave concern and demands adequate steps to avoid any long-term distress for the future generation of neurosurgeons. Some strategies can include standardization of hourly workloads, support groups, wellness programs, social events, and frequent interviews [3, 20–22].

Although no association with marital status was observed, our study revealed more kids tend to decrease the risk of burnout in neurosurgeons. Attenello et al. marked limited influence of personal characteristics on burnout in neurosurgical residents [23]. Another study by Khalafallah et al. revealed having children is an independent protective factor for burnout [24]. Shakir et al. also observed lack of children is associated with a risk of high burnout [25].

Khalafallah et al. observed neurosurgeons practicing from 5 to 15 years were at a higher risk than their junior group, whereas we observed recently qualified neurosurgeons to be at higher risk of burnout [24]. However, the former study was conducted during the covid-19 pandemic [24]. Another study by McAbee et al. observed limited influence of career stage on the status of burnout [11]. The high risk of burnout in younger neurosurgeons can be attributed to adjustment to the new role and schedule; however, more studies are required to inquire about the relation comprehensively.

More weekly calls have been considered a contributing factor to burnout in residents, and similar would be expected in neurosurgery consultants [9]. However, our study observed the consultants with burnout to have a lower mean of weekly calls, which is an unexpected finding. It can be due to neurosurgeons performing more weekly calls to have a higher satisfaction level for their work.

The limitations of this study included a lack of consideration of well-being programs at any organization of the respondents to reduce the risk of burnout. This may have allowed us to comment on the effectiveness of such programs. Another was a lower number of female respondents. More occupational stresses should be assessed in future studies with large samples to further comprehend this complex and widespread condition.

## Conclusion

Burnout syndrome remains a widespread condition in neurosurgical healthcare workers, especially residents. Regular assessments and adequate steps to counter burnout should be taken at the individual and organizational levels to avoid associated risks to physician safety and patient care.

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## Declarations

**Conflict of interest** None.

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