

ANALYSIS OF THE LEARNING CLIMATE AND BURNOUT ASSOCIATED FACTORS AMONG NEUROSURGICAL TRAINEES IN MOROCCO: - A NATIONAL SURVEY BASED STUDY -

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ABSTRACT:

Objective: To evaluate the learning climate and the specific risk factors for burnout among neurosurgery residents and young neurosurgeons in Morocco.

Methods: A questionnaire was designed and sent to all neurosurgery residents and young neurosurgeons (early career physicians of less than 5 years practice), belonging to the six university hospitals and to neurosurgery departments in level two hospitals. The survey examined the overall satisfaction rates, burnout rates (through the Maslach Burnout Inventory – MBI), and the learning climate (through the Deutch Residency Educational Climate Test – D-rect).

Results: 44 answers were received out of 212 e-mails sent. Of the respondents, 77.3% were in a burnout state according to the MBI, and nearly half of them (47.7%) were experiencing a low personal achievement state. Although a trend towards a lower personal achievement in young residents was observed ($p=0.188$), no statistical significance was seen between the two populations or inside the residents' population. Participants to the survey responded with low satisfaction rates regarding the work/life balance (18,2%), quality of life (22,7%), working environment (27%), future perspectives (14,9%), and salary (6,8%). The D-rect scores showed a positive feedback throughout the participants, suggesting a favorable learning climate.

Conclusions: Burnout risks tend to be multifactorial, and our study showed that despite a favorable learning climate, the impact of the very low satisfaction rates expressed regarding the working environment, the work/life balance, the future perspectives and the salary led to the high burnout rates observed among participants.

Keywords: Burnout, Learning climate, Neurosurgery, Morocco.

INTRODUCTION

The transmission of knowledge and expertise is the only guarantee to maintain the sustainability of the healthcare systems and prevent their future collapse. Therefore, providing a high-quality medical training while improving hospital work conditions is being

one of the major concerns of every training and research medical unit in teaching hospitals.

In the recent years, many papers showed interest in evaluating the quality of the medical training programs and the learning climate, and their effects on the performances and the appearance of “burn-out syndrome” among different specialties. This would

be especially interesting to consider among the neurosurgical population where the program is dictated by rigor, and known to be particularly stressful, and both technically and psychologically challenging [1-3]. In fact, it has been established that burn out syndrome is high among the medical population, influencing the performances, the satisfaction rate, the risk of medical errors and thus on patient's security. Martini et al. reported that 50% of residents from different medical specialties in the United States suffer from burn out syndrome [3], and Attenello et al. reported a burn-out rate of 67% among neurosurgery residents [4]. In Morocco, only 3 studies assessed burn out syndrome among medical practitioners in 39.7%, 83% and 58.3% [5-7], but none have evaluated its severity and the associated factors among the specific neurosurgical population. Burnout risk tends to be multi-factorial, but considering the impact of negative learning climate and work-related conditions on surgeon's productivity, we assessed this study to evaluate the specific risk factors among neurosurgical trainees and young neurosurgeons in Morocco, and try to come out with clear recommendations.

MATERIALS AND METHODS

Study design

This is a nationwide survey that was conducted during a period of three months (February to April 2019). A questionnaire was prepared through the online application "Google Forms" (Google Inc., California, USA), and got approval from the local ethics committee of the university. An email including the link to the form was sent to all residents and young neurosurgeons (early career physicians with less than 5 years of practice), registered in the mailing list of the Moroccan society of neurological surgeons (belonging to six university training hospital centers and to neurosurgical departments in level two hospitals).

Early career physicians were enrolled in the study for two reasons: first, because they can easily recall and reliably judge the learning climate they evolved in, and second to evaluate the difficulties facing these youngsters in their actual practice.

The email outlined the aims and scope of the study and the completely anonymous interpretation of the results. Directors of training programs also received an email to encourage their residents to participate to the study. Reminder emails were sent at 2 weeks intervals to encourage the most reluctant to respond to the survey. Participants were acknowledged that

the results of the study will be subject to a scientific publication.

Participants were also given a free text column to outline the positive and negative aspects during their training, and whether these influenced on their hardship.

Survey design

The form was a 4 chapters questionnaire including:

- **Epidemiological aspects:** demographics, personal and professional activity,
- **Overall satisfaction questionnaire** with 5-point Likert-type scale answers, assessing work-related conditions
- **Burn-out questionnaire:** through the validated Maslach Burnout Inventory – MBI, including the full 22 items and considering Emotional Exhaustion, Depersonalization, and Self-Fulfillment) [8,9].
- **and the D-rect questionnaire:** Deutch Residency Educational Climate Test, that evaluates the working environment and the educational climate through 50 items, using a 5-point Likert-type scale, and thus scoring the overall learning climate from 1 (not relevant) to 5 (highly relevant) [10]. For this questionnaire, we used a French version of the D-rect that was recently validated and published [11].

Data was then analyzed using the SPSS software with the Chi-2, T-test and Mann-Whitney-U test.

The primary outcome of the study was to evaluate the burnout rate, the learning climate and the influence of the working conditions on generating burnout among the selected neurosurgical population.

RESULTS

Among the 212 e-mails sent, 44 answers were received (20.75% response rate), from the different university hospitals and level-two hospitals, distributed over the different years of training. It is of note that 41% of the respondents were registered at Ibn Sina University Hospital in Rabat.

The mean age was 35.5 y.o, with a clear male preponderance (90% males). One third of the participants were single, and only one third could achieve a regular physical activity.

The mean estimated weekly work time was 48 hours, including two scheduled operative days, and the median number of shifts was estimated at 8 units a month (of 24h each), with at least two working week-end days per month (Table 1).

Table 1: Demographics, personal and professional activity

Variable	Results
Mean Age (years)	35.5
Gender	
Male	40 (90.9%)
Female	4 (9.1%)
Marital status	
Single	14 (31.8%)
Married	28 (63.6%)
Degree	
1st year	9 (20.5%)
2nd year	4 (9.1%)
3rd year	2 (4.5%)
4th year	3 (6.8%)
5th year	7 (15.9%)
Young neurosurgeon (<5 years practice)	19 (43.2%)
Regular Physical activity	
Yes	14 (31.8%)
No	30 (68.2%)
Mean Work time/week (hours)	48
Mean Shifts/months (days) (range)	8 (4 – 10)
Week-end working days /month (range)	2 (2 – 4)
Median Operative days/week (range)	2 (1 – 4)

Overall Satisfaction questionnaire: (Table II)

Thirty-six participants (81.6%) were satisfied (very satisfied and satisfied) by their choice of specialization, as most of them (80%) have always been interested in making a career in Neurosurgery. However, rates of satisfaction for the rest of the items in the questionnaire are far lower: Eight participants (18.2%) expressed their satisfaction regarding the balance between private and professional life, ten (22.7%) regarding their global quality of life, seven (14.9%) regarding the future perspectives and only three (6.8%) regarding the salary. Moreover, only twelve of them (27%) were satisfied by their working environment, with a

statistically significant difference between residents and young neurosurgeons (60% Vs 31.6% P=0.04). The quality of the neurosurgical training was judged satisfying by 70% of the participants in the theoretical aspects and 54% in the practical aspects. Fifty percent of the participants estimated that the training program provides sufficient autonomy to handle neurosurgical pathologies. However, 84% of the participants regrets the lack of a tutoring program. Despite this, if participants were given the opportunity to change specialization, 56% of them would choose neurosurgery again, with a statistically significant difference between residents and young neurosurgeons regarding this repetition of the choice of specialty (76% vs 31.6% p=0.005)

Table II: Work related and overall satisfaction questionnaire

Satisfaction Questionnaire items	Overall Results: number (%)	Residents vs. YNS response analysis
Choice of Specialty:		
Very unsatisfied	0	p=0.183
Unsatisfied	3 (6.8%)	
Neutral	5 (11.3%)	
Satisfied	16 (36.4%)	
Very satisfied	20 (45.5%)	
Work Environment:		
Very unsatisfied	3 (6.8%)	P=0.044
Unsatisfied	20 (45.5%)	
Neutral	9 (20.4%)	
Satisfied	12 (27.3%)	
Very satisfied	0	
Work-life balance:		
Very unsatisfied	9 (20.4%)	p=0.135
Unsatisfied	18 (40.9%)	
Neutral	9 (20.4%)	
Satisfied	8 (18.2%)	
Very satisfied	0	
Global quality of life:		
Very unsatisfied	2 (4.5%)	p=0.183
Unsatisfied	19 (43.2%)	
Neutral	13 (29.5%)	
Satisfied	9 (20.4%)	
Very satisfied	1 (2.3%)	
Personal Health Quality:		
Very unsatisfied	0	p=0.487
Unsatisfied	12 (27.3%)	
Neutral	11 (25%)	
Satisfied	15 (34.1%)	
Very satisfied	6 (13.6%)	
Salary Evaluation:		
Very unsatisfied	18 (40.9%)	p=0.660
Unsatisfied	19 (43.2%)	
Neutral	4 (9.1%)	
Satisfied	3 (6.8%)	
Very satisfied	0	
Future perspectives:		
Very unsatisfied	6 (13.6%)	p=0.194
Unsatisfied	9 (20.4%)	
Neutral	22 (50%)	
Satisfied	5 (11.4%)	
Very satisfied	2 (4.5%)	
Neurosurgery as first choice:		
Yes	35 (79.5%)	p=0.005
No	9 (20.5%)	
Not Sure	0	
Choose Neurosurgery again?		
Yes	25 (56.8%)	
No	8 (18.2%)	
Not Sure	12 (27.3%)	

The Maslach burnout questionnaire: (Table III)

According to the MBI, burnout is defined by either a high score in the emotional exhaustion (EE) sub-scale, and/or a high score in the depersonalization (DP) sub-scale and/or a low score in the personal achievement (PA) subscale. The number of altered

dimensions will define the severity of the burnout as low (one dimension), moderate (two dimensions) or severe (all three dimensions) [9]. Among the 44 participants to this survey, 34 (77.3%) had a burnout according to the Maslach burnout inventory (MBI): 20 (45.5%) had high emotional exhaustion (EE) scores, 16 (36.4%) had high

depersonalization (DP) scores and 21 (47.7%) had low personal achievement (PA) scores. There was no statistically significant difference between residents and young neurosurgeons (80% vs 73.7%; p=0.620) although a trend toward a lower personal accomplishment rate was observed for young

neurosurgeons vs. residents (47.7% vs. 36% p=0.188) (Table III). In addition, there was no statistically significant difference inside the resident’s population (PGY1-3 vs. PGY4-5; p=0.689).

Table III: Maslach Burn-out questionnaire

Variable	Residents	Young neurosurgeons	Results	p
Emotional exhaustion				
Low score	5 (20%)	6 (31.6%)	11 (25%)	0.491
Moderate score	9 (36%)	4 (21.1%)	13 (29.5%)	
High score	11 (44%)	9 (47.4%)	20 (45.5%)	
Depersonalization				
Low score	8 (32%)	6 (31.6%)	14 (31.8%)	0.733
Moderate score	9 (36%)	5 (26.3%)	14 (31.8%)	
High score	8 (32%)	8 (42.1%)	16 (36.4%)	
Personal accomplishment				
Low score	9 (36%)	12 (63.2%)	21 (47.7%)	0.188
Moderate score	6 (24%)	2 (10.5%)	8 (18.2%)	
High score	10 (40%)	5 (26.3%)	15 (34.1%)	
Burnout				
Yes	20 (80%)	14 (73.7%)	34 (77.3%)	0.620
No	5 (20%)	5 (26.3%)	10 (22.7%)	

The learning climate (D-rect scale):

The mean scores of each domain of the D-rect scale are shown in table IV. The domains that showed the highest scores were “supervision”, “teamwork”, “relation to attendings”, “attendings role” and “sign-out”. One the other hand, the domains that had the lowest scores were: “coaching”, “feedback”, “formal

education” and “tutor”. The scores expressed by burnout and non-burn-out groups were compared; we found no significant difference between the two groups concerning the satisfaction items. Also, no difference in scoring was found between the residents’ and the young neurosurgeons’ group, or inside the resident’s population (PGY1-3 Vs PGY4-5).

Table IV: D-rect Scores and comparison between burnout and non-burnout participants

Variable	Mean Score	Burnout (n = 34)	No burnout (n = 10)	p
Status				
Residents		20	5	0.620
Young neurosurgeons		14	5	
Satisfaction means				
Supervision	3.6	3.51	3.93	0.654
Coaching	3.25	3.16	3.62	0.165
Feed back	2.81	2.78	2.93	0.894
Teamwork	3.71	3.66	3.90	0.675
Peer Collaboration	3.54	3.56	3.46	0.388
Relation attendings	3.68	3.60	4.00	1.000
Work Adapted	3.47	3.37	3.85	0.844
Attending’s role	3.88	3.78	4.25	0.614
Formal education	3.22	3.19	3.35	0.211
Tutor	3.23	3.21	3.30	0.485
Sign-out	3.69	3.68	3.70	0.784

DISCUSSION

While most available studies on burn-out among neurosurgeon's population were conducted in high-income countries, to date, only one study investigated this issue in low- and middle-income countries, part of a global neurosurgery pilot study, with only 7 participants from Morocco [12]. American and European countries have much higher standards for medical care, practice and training, but considering that neurosurgical practice is a worldwide condition, we wanted to assess the rates of satisfaction and burnout among our trainees and correlate our findings to the local conditions.

One of the main challenges encountered during the elaboration of this study was to face the reluctance of candidates to adhere to this survey, which later represents one of the limitations of this study, as the sample may not represent the population of residents in training. In fact, among the 212 emails sent, only 44 answers were received (20% participation rate), despite the two reminder emails [13]. Shakir et al. reported a participation rate of 21.3%, and McAbee et al. 24% of participation, and both explained these results by a possible concern about the anonymity of the survey, or a high degree of burn-out that may prevent participation [1,14]. Majbar et al, on their study about the training program of general surgeons in Rabat-Morocco, had 75% of the residents volunteering to respond to the questionnaire [5]. This difference can be explained by the fact that each department was represented by one of the co-authors of their study, motivating the residents and ensuring the anonymity, while in our study all the co-authors were from Rabat (the most represented department) making it harder to regularly motivate the participants from other departments and from different cities.

Our study showed that 77.3% of the participants are in a Burnout state. Compared to general surgery residents in Morocco (58.3% Vs 77.3%) [5], and to other published neurosurgical data worldwide, ranging from 27% to 67% [1,4,15–17] such a high score is alarming. While our study failed to identify clearly statistically significant factors directly related to burnout, it highlighted many domains of dissatisfaction that may have influenced the burnout status of our participants.

Many studies have shown interest on why burnout rates tend to be higher in the neurosurgical population than other specialties, and the reasons tend to be multifactorial. First, neurosurgery has always been regarded as a stressful specialty, and training is both physically and psychologically challenging, given the hardness of the pathologies that are treated, and the high level of resilience

requested that may otherwise lead to a low personal accomplishment state [1,3,4,17].

One's own perception of well-being is also an important factor, and stressor as well, in protecting or generating burn-out among practitioners, and a good work/life balance was found to be positively correlated with career satisfaction [14,17–19]. Our participants showed very low satisfaction rates concerning the work environment, work/life balance, salary, and expressed many uncertainties regarding their future perspectives, all representing statistically identified factors of burn-out in many published papers, and have been identified recently to affect resident's resilience and grit in facing the adversity of neurosurgical practice [17].

Our results can also be explained by the high weekly workload. Including the shifts, participants work 96 hours (48 regular hours and 2 shifts a week), thus exceeding fairly the 80 to 88 hours of work allowed by the "Accreditation Council for Graduate Medical education" [20]. Also, because of the advances in electronic communications, the line between work and personal life has become vague which makes it an additional source of distress and possible burnout [4,5,18].

However, papers in the literature remain conflicting about the impact of workload on burn-out status [3,5,22,23]: Elmore et al., in their study of burn-out among US general surgeons found a mean working time of 80 hours (60-120) per week and identified it as a factor associated with burn-out [24]. On the other hand, Shakir et al. and Jean et al. showed that even if neurosurgery residents in the US/Canada, tend to work more hours (compared to other specialty residents), the rate of burn-out was lower [1,12], which suggests an impact of the hospital work environment and the learning climate on these results.

The D-rect is a more accurate way to evaluate the effect of the learning climate on the mental state of the participants by exploring the quality of time spent at the department. For instance, this scale evaluates team work, supervision, coaching, feedback, relation to attendings, attending's role, formal education, tutoring and work adaptation which was found out to cover many aspects on the daily working life [10]. Surprisingly, the results of the D-rect questionnaire in our study showed fairly satisfactory rates among the participants (for both residents and young neurosurgeons) with no significant difference between the burnout and non-burnout groups (Table 4).

Meanwhile, participants do admit that the training committees of universities have made efforts concerning the training program for the last years. In fact, the neurosurgical training program in Morocco is full of scientific activities; workshops are

regularly organized to fill the lack of some techniques; monthly off-site meetings are organized to discuss medical cases and strengthen the sense of partnership between colleagues; residents and young neurosurgeons are encouraged to participate to national and international meetings, and to pursue fellowships abroad.

Some authors have noted that burnout rates seem to be higher in trainees than in specialists [1,12,18]. In fact, trainees are overwhelmed with the stress of being physicians and the development of their competencies, while giving the best quality of care to the patients especially in non-surgical matters that seems to be less tutored. The curve described by Shakir et al. shows higher rates of burnout in the first couple of years of residency, a decrease on the third and fourth year, than an increase of the rates on senior residents' due to the consequential amount of responsibility. It also shows a second pic during the first 2 years post-graduation being explained by the change of the surgical responsibility and the personal life changes that come with the degree [1].

The problems of the hospital working environment, considered as public health issue in our context, were statistically worse for young neurosurgeons than residents ($p=0.044$). This is explained by the failure of our health system with those slow-working, ill-equipped level two hospitals. Also, opportunities in teaching hospital remains rare, the future of neurosurgical residents unclear, and the salary non-satisfactory. The financial aspect remains in a lot of countries a significant factor of burnout in medical specialties due to the important rates of debts, and delays the timing of important personal decision leading to burnout [4]. Although the definition of work-related factors may be large and somewhat subjective, participants pointed many other issues related to their unwell-being: inadequate operating room exposure and equipment, lack of human resources, and no restrictions in duty hours nor stated recovery time. This explains why only 31.6% of young neurosurgeons would choose neurosurgery again and their trend toward a lower personal accomplishment rate.

If the choice of specialty remains satisfying for 81.9% of the residents in our study, it is our duty to help trainees build resilience around their choice and care for their emotional health and future practice by motivating an upgrade of their working conditions especially in level two hospital.

Many efforts are still needed in mentorship and tutoring programs to allow more individual form of training based on carrier guidance and prevent burnout [4], but mainly in assessing a better hospital working environment to all.

Limitations of the study

As stated earlier, the number of respondents to the survey represents a limitation in performing our statistical analysis and reliably analyzing the results. Another limitation may have issued from the time needed to fill the form: on average, it took 12 to 15 minutes to fill the form, which may have prevented some participants to continue on submitting their responses.

The MBI and D-rect questionnaires used in this study, initially designed in English language, were translated into French language to ensure a wide comprehension of the different items. Although the D-rect adaptation was validated with a good internal consistency and temporal reliability, the translation may hold misinterpretation of the different items in our context.

Finally, the univariate analysis and the lack of a clear statistical significance throughout the study may also be regarded as a limitation, although we have noticed trends and identified factors of dissatisfaction that were largely associated with burn-out in the literature.

CONCLUSION

Burnout remains a public health issue that is neglected in the Moroccan health system. Several factors have been identified as predictors to burnout in physicians, which impact the residents' training. This study highlights the fact that even with a favorable learning climate, the consequences of the hospital working environment and the strong imbalance between work/personal life leads to higher burnout rates among neurosurgical residents and young neurosurgeons in Morocco. Many efforts have been made by the neurosurgical program directors, but the road is still long to make significant changes in the medical system and improve hospital work environment.

Authors Contribution:

Mohammed Yassaad Oudrhiri, author; Hajar Bechri, Co-author; El Mehdi Hakkou, Co-author; Adyl Melhaoui, reviewer; Yasser Arkha, reviewer; Abdessamad El Ouahabi, reviewer and Director of Education Training and Research Program in Neurosurgery.

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Abbreviations List:

- MBI: Maslach Burnout Inventory
- D-rect: Deutch residency educational climate test.
- EE: Emotional exhaustion.
- DP: Depersonalization.
- PA: Personal accomplishment.
- PGY: Post-graduate year.
- US: united States.

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