M. Babiker, E. Merisalu, Ž. Roja, H. Kalkis*

PROSPECTIVE EFFECTS OF ARTIFICIAL INTELLIGENCE ON BURNOUT SYNDROME: REDUCING RISKS AND ENHANCING PSYCHOLOGICAL WELL-BEING

SUMMARY: Burnout is a major global issue in healthcare that have a negative influ-ence on patient care and health quality. As predicted by researchers, robots, algorithms, smart technology, and artificial intelligence (STARA) account for one-third of all em-ployment currently held by humans. Through creative solutions, artificial intelligence (AI) offers enormous possibilities to lessen the managerial and cognitive constraints that lead to burnout. A cross sectional study used MBI and STARA awareness to calculate prevalence of artificial intelligence and burnout syndrome and to determine whether the use of AI reduces or increases the impact of burnout syndrome risks on healthcare prac-titioners. The average mean rating for burnout dimensions had been as follows: 28.65 ±14.89 SD for Emotional Exhaustion (EE), 9.89 ± 6.83 SD for Depersonalization (DP), and 39.72 ± 8.71 SD for Personal accomplishment (PA). The highest mean of partici-pants, agreement recorded for the item "I am personally worried about my future in my industry due to AI replacing employees" 1.36 + 1.06, the total mean was 1.22 + 0.13 at level Disagree. Increased STARA awareness had a positive association with burnout. Burnout is linked to signs of personal and professional burden and appears to be a prevalent issue among physicians. Suggestions for bettering working circumstances are made. Being aware of AI patterns of use and specific characteristics linked to burnout, however, is an essential step to reduce the impact of burnout and AI awareness. Further investigation is required to determine the causes and establish appropriate measures for intervention.

Key words: artificial intelligence, technology, STARA, burnout syndrome, healthcare

INTRODUCTION

The term "burnout syndrome" refers to the negative effects that extreme emotional stress at work that are connected to occupations requiring care for others. Healthcare workers are vul-nerable to burnout because they are employed in high-stress environments and face a wide variety of occupational stressors, including time constra-ints, a lack of social support at work, a heavy wor-kload, uncertainty about patient treatment. Due to these factors, there is a greater chance that he-althcare workers may experience stress and bur-nout, which can negatively af-fect the standard of care they offer *(Galletta et al., 2016)*. Furthermo-re, the health care is de-fined by ongoing changes in technology, which add to the complexity of the task and have a detrimental effect on well-being of patients and quality of patient care.

Burnout was defined by the eleventh Versi-on of the International Classification of Diseases (ICD-11) as a "Burn-out is a syndrome conceptu-alized as resulting from chronic workplace stre-ss that has not been successfully managed. It is characterized by three dimensions: 1) feel-ings

*MA Marwan Babiker, (marwannet21@gmail.com), (corresponding author), University of Latvia, Riga, Latvia, Royal Commission Health Service Program, Al Jubail, Saudi Arabia, Prof. Eda Merisalu, Estonian University of Life Sciences, Tartu, Estonia, Prof. Ženija Roja, University of Latvia, Riga, Latvia, Prof. Henrijs Kalkis, University of Latvia, Riga, Latvia.

of energy depletion or exhaustion; 2) increased mental distance from one's job, or feel-ings of ne-gativism or cynicism related to one's job; and 3) a sense of ineffectiveness and lack of accomplis-hment", the World Health Organization (WHO) recognizes burnout as an "occu-pational pheno-menon" *(Atroszko et al., 2020.)*. The prevalence of burnout among physicians has grown to such an extent that it is now seriously affecting the workforce. The Association of American Medical College predicted in 2021 that by the year 2034, there may be between 37,800 and 124,000 fewer doctors in the United States *(Pasha et al., 2024)*. The Mercer anal-ysis predicts that by 2026, the-re will be a shortfall of more than 3 million he-alth care profes-sionals (HCPs); *(Pellegrini et al., 2014)*.

Prominent scientists and entrepreneurs have expressed concern about the potential for mass joblessness because of the emergence of "STARA" technology, which stands for smart tech-nology, artificial intelligence, robotics, and algorithms, it is predicted to have taken up one-third of all jobs *(Pavuluri et al., 2024)*. In the era of AI, workers with a high level of knowledge about AI perceive a very uncertain future for themselves; they expe-rience stress because they feel that their jobs are insecure *(Ito et al., 2021)*.

The aim of this study was to investigate the prevalence of artificial intelligence and burnout syndrome and to determine whether the use of AI reduces or increases the impact of burnout syn-drome risks on healthcare practitioners.

METHODOLOGY

A cross-sectional study was conducted In Mar-ch 2024, at the Family Medical Centers (FMCs) in Jubail, Saudi Arabia, which are part of the Royal Commission Health Service Program among all 57 physicians working there to determine their degree of burnout and measure AI Awareness. 51 doctors answered the questions and finished the survey. There were 89% re-sponses. A validated questionnaire that was self- administered with three parts: demograph-ic data, the Maslach Bur-nout Inventory for Medical Personnel, and STARA were used to col-lect the data.

Ethical approval to conduct the study have been approved through the Institutional Review Board committee of the Royal Commission He-alth Service Program to conduct the disserta-tion and survey among the physicians of the family medicine centers. The Chief of family medicine centers approved the study and provided tech-nical support to conduct the survey among the physicians. A consent form was obtained for par-ticipation in the study, Informed consent was sent by the department e-mail clarifying that participa-tion was voluntary, not as-sociated with any types of harm, with no consequences for non-partici-pation. Prior to the start of the study, an overview regarding the purpose and subject of the investi-gation as well as a survey were given to the team of physicians.

Three components of a validated, self-admi-nistered questionnaire were used to gather the da-ta: The first part of the questionnaire assesses the demographic and working conditions data. The second component of the questionnaire is the MBI, was designed specifically for use by he-althcare workers (Medical Personnel). It was deve-loped by Maslach and Jackson in 1981 *(Maslach, Jackson, 2013)*. MBI is validated and reliable tool to identify determinants of burn-out *(Maslach et al., 2001)*. It includes 22 self-completion questi-ons which focus on the three elements, personal accomplishment (8 items), depersonalization (5 items), and emotion-al exhaustion (9 items). Data were interpreted according to the MBI Manual, the questions are divided into three scales, each with seven points, ranging from 0 to 6 that .is used by the re-spondent when answering this question. Considering that there are three levels of Burnout: high ($\geq$ 27 points), moderate (between 17 to 26 points), and low (<16 points) for emotional exha-ustion; high ($\geq$ 13 points), moderate (between 7 and 12 points), and low (<6 points) for deperso-nalization. In contrast to the other scores, the per-sonal achievement score for high level (ranging from 0 to 31 points), moderate level (ranging from 32 to 38 points), and low level ($\geq$ 39 points) is negative *(Jackson, Leiter, 1996)*.

The third part is related to Artificial Intelli-gence (AI), which is adopted scale to measure AI Awareness was developed by Brougham and Haar *(2018)*. A measure called STARA aware-ness

was used in this study that captures the extent to which employees feel their job could be replaced by these types of technology. The original scale was appropriately revised according to "smart technology, automation, robotics and AI" (STA-RA), according to the job insecurity measurement by Armstrong-Stassen *(Brougham, Haar, 2018)*. STARA will be clarified for respondents as a method that expected to change job contents and workplaces in the coming next 10 years. This scale is consisting of four items on this scale, first is "I think my job could be replaced by AI", second one is "I am personally worried that what I do now in my job will be able to be replaced by AI", third is "I am personally worried about my future in my organi-zation due to AI replacing employees", the fourth is "I am personally worried about my future in my industry due to AI replacing employees" *(Brougham, Haar, 2018)*.

RESULTS

Socio-demographic variables and working condition data

In total 51 participants were enrolled in this study, with the response rate 89%. Most of them were female (52.9%), while males represented (47.1%). Many of the respondents (41.2%) within the age range (31-40) years. Many of them were married 84.3%. 88.2% of the partici-pants have children. Their highest degree was Bachelor (47.1%). Their specialty was mostly general practitioners (33.3%), followed by Family Medicine (27.5%). Most of the respondents their years of practice were in group $11 \leq x \leq 20$ (37.3%). The most average number of pa-tients seen per day was 31 to 40 patients (39.2%), however, most of them (47.1%) were neu-tral according to Salary Satisfaction, while the same proportion of the participants (47.1%) were satisfied with their job. In addition, no tasks other than clinical work (e.g., administra-tive work) 74.5%, whilst the vast majority have no Smoking History 82.4%.

Burnout indicators

The average score for burnout dimension showed in Table 1. Depersonalization had been 9.89 ± 6.83 SD, the average value for Personal Accomplishment was 39.72 ± 8.71 SD, and the av-erage rating for Emotional Exhaustion was 28.67 ± 14.91 SD.

Table 1. **Mean and Standard deviation (SD) total score for burnout dimensions**

Tablica 1. Srednja vrijednost i ukupni rezultat standardne devijacije (SD) za dimenzije izgaranja

Dimensions	Mean	SD
Emotional Exhaustion	28.65	14.89
Personal Accomplishment	39.72	8.71
Depersonalization	9.89	6.83

The proportions and rates at every level in the survey questionnaire showed in Table 2, the high levels in every burnout dimension clarified as: 49% of the respondents had high scores for emotional exhaustion; additionally, 29.4% of respondents had high scores for depersonali-zation; and 13.7 % of respondents had significant burnout in personal accomplishment.

Table 2. **Frequencies and percentages of levels of Burnout in EE, PA, and DP (N=51)**

Tablica 2. Učestalosti i postoci razina izgaranja u EE, PA i DP (N=51)

Dimensions	Burnout					
	Low		Moderate		High	
	N	%	N	%	N	%
Emotional Exhaustion	12	23.5	14	27	25	49
Personal Accomplishment	39	76.4	5	9.8	7	13.7
Depersonalization	18	35.3	18	35.3	15	29.4

The statistically significant correlation between every item on the questionnaire and the demo-graphic characteristics is displayed in Table 3. The findings indicate a substantial correlation between the EE level and the following variables: highest degree, specialty, average number of patients seen each day, and job satisfaction. The highest degree, job satisfaction and PA level are significantly correlated. The highest degree and the DP level have a significant corre-lation (P = 0.011).

Table 3.   Relationship between questionnaire parts and demographic data

Tablica 3. Odnos između dijelova upitnika i demografskih podataka

Dimensions	X²	P. value
Emotional Exhaustion level		
Average number of patients per day	12.548	0.007**
Specialty	27.805	0.002**
Highest Degree	12.548	0.013*
Job Satisfaction	12.148	0.015*
Personal Accomplishment level		
Job Satisfaction	12.134	0.015*
Highest Degree	10.425	0.033*
Depersonalization level		
Highest Degree	12.979	0.011*

X²=chi-square test., * P. value is significant at level 0.05, **P. value is significant at level 0.01

The significant factors are identified in the Univariate analysis (p < 0.05) were a specialty, years of practice and an average number of patients seen per day P. value recorded 0.000, 0.000, and 0.001, respectively.

In Multivariate analysis, the significant factors where (p<0.05). EE showed association be-tween burnout scale and risk factors (Specialty, Years of practice, average number of patients seen per day), in favor of family medicine specialty, years of practice (>20), Average number of patients seen per day (31-40). In PA, the associated risk factors (Years of practice, Salary Satisfaction, Job Satisfaction, and Tasks other than clinical work (e.g., administrative work), in favor of Years of practice

(≤5), Salary Satisfaction (Not Satisfied). Job Satisfaction (Not Satisfied) and having tasks other than clinical work (e.g., administrative work). in DP, there are association between (Specialty, Average number of patients seen per day, and Job Satisfaction), in favor of, Specialty Dentists, Average number of patients seen per day (31-40) Job Satisfaction (Not Satisfied).

Artificial Intelligence indicators

The mean and standard deviation of participants, agreement for Artificial Intelligence (AI) Awareness. The highest mean of participants, agreement recorded for the item "I am personal-ly worried about my future in my industry due to AI replacing employees" 1.36+ 1.06, the total mean was (1.22 + 0.14) at level (Disagree); (See Table 4).

Table 4.   Mean and standard deviation (SD) of Artificial Intelligence (AI) Awareness

Tablica 4. Srednja vrijednost i standardna devijacija (SD) svijesti o umjetnoj inteligenciji (AI)

Statement	Mean	SD
I think my job could be replaced by AI	1.12	0.99
I am personally worried that what I do now in my job will be able to be replaced by AI	1.1	0.91
I am personally worried about my future in my organization due to AI replacing employees	1.33	1.09
I am personally worried about my future in my industry due to AI replacing employees	1.36*	1.06
Total Mean (Level: Disagree)	1.22	0.13

DISCUSSION

Among of all the burnout dimensions, the emotional exhaustion subscale had the highest scores (49%), followed by depersonalization (29.4%) and low sense of personal achievement (13.7%). Though it was comparable to the 47.4% rate reported by another study performed in the Al-Ahsa district of the Eastern province of Saudi Arabia. The rates of extreme emotional exhausti-on were 46% and 53%, respectively, in the other two Saudi Arabian investigations involving Saudi

nurses *(Al-Turki, 2010)* and primary care physicians. Numerous Middle East-ern countries have reported a higher rate of burnout *(Chemali, 2019)*. Between 40 and 60 per-cent of Middle Eastern healthcare practitioners were found to have the condition, according to a comprehensive review that included 138 published research *(Chemali, 2019, El-Menyar, 2021)*. Even though the MBI assessment method was utilized in most of these investigations, there was variance in the study site and specialties among the healthcare workers. In a related field, family medicine doctors in European countries were found to have burnout rates as high as 43% *(Soler et al., 2008)*. A prevalence of 38% among transplant surgeons was found by Bertges et al. *(Yost et al., 2005)*. The findings are compatible with published studies that demonstrate an increased risk of burnout among physicians, and individuals with drug history for depression; financial responsibility (salary satisfaction) and specialty could be contributing factors to burnout *(Al-Haddad et al., 2020)*. This study observed a solid relationship between the risk of burnout and the participants' specialty, years of practice, job satisfaction, salary satisfaction, additional administrative work, number of patients seen per day and smoking and drug history.

This study investigated how workers see their possible future paths and occupations in this dynamic environment. Overall, the study's findings demonstrate how STARA is now viewed in relation to outcomes related to employment and well-being. Increased STARA awareness had a positive association with burnout, this outcome is consistent with the earlier research carried out by David Brougham and Jarrod Haar *(2018)*, which showed a minimal belief in the prospect of artificial intelligence, robots and machines replacing jobs in work settings, with a mean score of 1.7 (on a 1–5). Furthermore, other study conducted in China, the finding demonstrated that job burnout and AI awareness were positively correlated. The association between job burnout and AI awareness were mediated by organizational commitment *(Kong et al., 2021)*.

This study included many risk factors that has been reported elsewhere in the previous studies and published reports. The variables that have been linked to induce burnout and AI aware-ne-ss were reflected in the questionnaire, which was created with reference to the most recent research available now. However, it is possible that other factors will also come into effect, these features were unfortunately excluded from the scope of our survey.

It is possible that certain limitations were imposed on the study's results. First, a cross-sectional design, which limits the observation of a causal relationship between the variables and outcomes, and limits confirmation of temporality of the factors of the burnout syndrome. Second, the study depends on self-reported validated rating scales and socio-demographic and working characteristics that increase the measurement error problems, related to the tendencies of the systematic response. Third, some of the reported relationships may be ex-plained by unmeasured confounding variables. Furthermore, because this study was conduct-ed in a single department in the hospital, its conclusions cannot be applied to all medical staff in other hospitals or regions.

CONCLUSION

This study showed a significant level of burnout among physicians especially in emotional exhaustion, which concurs with other studies. Other dimensions in comparison with other countries are still favorable regarding burnout syndrome. Physician burnout has an adverse effect on physicians, patients, and healthcare organizations. Healthcare institutions can lever-age AI's benefits while avoiding any potential risks by adopting a balanced approach. More investigation is required to fully understand the issue, create models to explain the phenome-na, and create workable action plans.

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LITERATURE

Al-Haddad, A., Al-Omar, F., Al-Khaleel, A. and Al-Khalaf, A.: Prevalence of burnout syn-drome and its related risk factors among physicians working in primary health care centers of the Ministry of Health, Al Ahsa region, Saudi Arabia, 2018–2019, *Journal of Family Medicine & Primary Care*, 9, 2020, 2.

Al-Turki, H. A.: Saudi Arabian nurses. Are they prone to burnout syndrome?, *Saudi medical journal*, 31, 2010, 3, 313-316.

Atroszko, P. A., Demetrovics, Z. and Griffiths, M. D.: Work addiction, obsessive-compulsive personality disorder, burn-out, and global burden of disease: Implications from the ICD-11, *International journal of environmental research and public health*, 17, 2020, 2, 660.

Brougham, D. and Haar, J.: Smart technology, artificial intelligence, robotics, and algorithms (STARA): Employees' perceptions of our future workplace, *Journal of Management & Or-ganization*, 24, 2018, 2, 239-257.

Chemali, Z., Ezzeddine, F.L., Gelaye, B., Dossett, M. L., Salameh, J., Bizri, M., Dubale, B. and Fricchione, G.: Burnout among healthcare providers in the complex environment of the Middle East: a systematic review, *BMC public health*, 19, 2019, 1-21.

El-Menyar, A., Ibrahim, W. H., El Ansari, W., Gomaa, M., Sathian, B., Hssain, A. A., Wah-len, B., Nabir, S. and Al-Thani, H.: Characteristics and predictors of burnout among healthcare professionals: A cross-sectional study in two tertiary hospitals, *Postgraduate medi-cal journal*, 97, 2021, 1151, 583-589.

Galletta, M., Portoghese, I., D'Aloja, E., Mereu, A., Contu, P., Coppola, R. C., Finco, G. and Campagna, M.: Relationship between job burnout, psychosocial factors and health care-associated infections in critical care units, *Intensive and critical care nursing*, 34, 2016, 59-66.

Ito, J. K. and Brotheridge, C. M.: An examination of the roles of career uncertainty, flexibil-ity, and control in predicting emotional exhaustion, *Journal of Vocational Behavior*, 59, 2021, 3, 406-424.

Jackson, S. E. and Leiter, M. P.: MBI: *Maslach burnout inventory*, 1996, CCP Incorp: Sunnyvale, CA, USA.

Kong, H., Yuan, Y., Baruch, Y., Bu, N., Jiang, X. and Wang, K.: Influences of artificial intelli-gence (AI) awareness on career competency and job burnout, *International Journal of Con-temporary Hospitality Management*, 33, 2021, 2, 717-734.

Maslach, C. and Jackson, S. E.: Burnout in health professions: A social psychological analysis, *Social psychology of health and illness*, 2013, 227-251.

Pasha, A. S., Niess, M. A., Parish, D. C., Henry, T., Krishnamoorthi, V. R., Baron, R. B. and Wan, S.: Complexities of Physician Workforce Projection: Call for a Unified National Healthcare Workforce Policy, *Journal of General Internal Medicine*, 39, 2024, 1-5.

Pavuluri, S., Sangal, R., Sather, J. and Taylor, R. A.: Balancing act: the complex role of artifi-cial intelligence in addressing burnout and healthcare workforce dynamics, *BMJ Health & Care Informatics*, 31, 2024, 1.

Pellegrini, L. C., Rodriguez-Monguio, R. and Qian, J.: The US healthcare workforce and the labor market effect on healthcare spending and health outcomes, *International Journal of Health Care Finance and Economics*, 14, 2014, 2, 127-141.

Soler, J. K., Yaman, H., Esteva, M., Dobbs, F., Asenova, R.S., Katić, M., Ožvačić, Z., Desgranges, J. P., Moreau, A., Lionis, C. and Kotányi, P.: Burnout in European family doc-tors: the EGPRN study, *Family practice*, 25, 2008, 4, 245-265.

Yost, W. B., Eshelman, A., Raoufi, M. and Abouljoud, M. S.: A national study of burnout among American transplant surgeons. In: *Transplantation proceedings*, 37, 2005, 2, 1399-1401, Elsevier.

MOGUĆI UTJECAJI UMJETNE INTELIGENCIJE NA SINDROM IZGARANJA: SMANJENJE RIZIKA I POVEĆANJE PSIHOLOŠKE DOBROBITI

SAŽETAK: Izgaranje na poslu predstavlja jedan od najvažnijih problema u zdravstvu i ima negativan učinak na brigu o bolesnima i kvalitetu zdravlja. Kako su istraživači i predvidjeli, roboti, algoritmi, pametna tehnologija i umjetna inteligencija (STARA) predstavljaju trećinu ukupnog rada osoba trenutno zaposlenih u zdravstvu. Kreativna rješenja koja omogućuje umjetna inteligencija pružaju goleme mogućnosti za smanjenje upravljačkih i kognitivnih ograničenja koja uzrokuju izgaranje. Studija presjeka koristila je svijest o MBI i STARA pri računanju prevalencije umjetne inteligencije i sindroma izgaranja kako bi se utvrdilo povećava li uporaba umjetne inteligencije ili smanjuje rizik simptoma izgaranja kod zdravstvenih radnika. Prosječna srednja stopa nađena za osobine izgaranja bila je: 28.65 ±14.89 SD za Emotivnu iscrpljenost (EE), 9.89 ± 6.83 SD za Depersonalizaciju (DP) i 39.72 ± 8.71 SD za Osobna postignuća (PA). Najviši prosjek slaganja među sudionicima odnosio se na stavku "Osobno sam zabrinut za svoju budućnost ako umjetna inteligencija zamijeni zaposlene" sa 1.36 +1.06, a ukupni prosjek neslaganja s tom stavkom bio je 1.22 + 0.13. Povećana svijest o fenomenu STARA pozitivno je korelirala s pojavom izgaranja. Izgaranje je povezano sa znacima osobnog i profesionalnog opterećenja i čini se da je najučestalije kod liječnika. Ponuđeni su prijedlozi za poboljšanje radnih uvjeta. Svijest o korištenju umjetne inteligencije i specifičnim osobinama izgaranja, međutim, bitan je korak za smanjenje utjecaja izgaranja i svijesti o umjetnoj inteligenciji. Potrebna su dodatna istraživanja kako bi se utvrdili razlozi i iznašle odgovarajuće interventne mjere.

Ključne riječi: umjetna inteligencija, tehnologija, STARA, sindrom izgaranja, zdravstvo