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Multi-level analysis of individual and work environment factors associated with nurses' perceived emotional exhaustion

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Abstract

Background
Several factors at the individual- and work environment-level were suggested to correlate with emotional exhaustion development in nurses.

Aim
To explore nurses' perceived emotional exhaustion and associated factors by employing hierarchical modelling techniques.

Methods
1539 nurses completed the cross-sectional survey. Generalized Linear Mixed Model was performed to identify predictors of emotional exhaustion.

Results
At the individual level, female gender, high workload and emotional job demands increased the risk of emotional exhaustion; instead, higher education, satisfaction with the role of follower, perceiving nursing profession as meaningful, feeling independent at work, and group closeness were protective factors. At the work environment level, hospital ward type did not affect emotional exhaustion.

Conclusions
Emotional exhaustion is largely influenced by ward culture and organizational policies, and to a lower extent by socio-demographic variables. Moreover, it emerges as an intrinsic risk of the nursing profession rather than being associated with the clinical area profile.

Keywords: Emotional exhaustion; Leadership; Job demands; Job resources; Nursing.

Highlights

- Emotional exhaustion persists as concerning problem for over 80% of nurses
- Female and lower-educated nurses are at higher risk of emotional exhaustion
- High workload and emotional job demands expose nurses to increased risk of emotional exhaustion
- Followership's satisfaction, group closeness, independence and meaning at work reduce the risk of emotional exhaustion
- Hospital ward type appears to be not associated with nurses' levels of emotional exhaustion

1. Introduction

The past decades have seen a growing interest around how healthcare work environment impacts on nursing workforce well-being outcomes including mental health, in addition to work outcomes (e.g., job performance, commitment, career satisfaction, and intention to leave the profession), organizational outcomes (e.g., job turnover, absenteeism, and sick leave) and patient outcomes (e.g., quality of care, patient safety) (Cummings et al., 2018). Among nurses' mental health outcomes, burnout has been the subject of several investigations as suggested by a recent theoretical review that identified over 90 papers about the causes and consequences of burnout in nursing (Dall'Ora et al., 2020).

Burnout has been originally conceptualized as a work-based psychological syndrome consequent to intensive physical, affective and cognitive strain due to prolonged exposure to certain job demands (Maslach, 1998). According to Maslach's conceptualisation, burnout is constituted of three dimensions, including a) emotional exhaustion – feeling of being emotionally drained and lacking emotional resources; b) depersonalisation – negative and detached response to others and loss of idealism; and c) reduced personal accomplishment – feeling of reduced competence and performance at work (Maslach, 1998). Demerouti and colleagues have more recently proposed the Job Demands-Resources (JD-R) model which conceptualizes burnout as a process rather than a state (Demerouti et al., 2001). According to this model, burnout is based upon excessive job demands such as high workload and emotionally demanding tasks leading to exhaustion, and insufficient job resources (e.g., co-worker support, role clarity) leading to disengagement (Demerouti et al., 2001). Thus, emotional exhaustion has been suggested to be the first step in the nurses' burnout process that moves forward only in presence of dysfunctional coping (i.e., cynicism and disengagement) (Gustavsson et al., 2010).

Several factors at the individual- and work environment-level were suggested to correlate with emotional exhaustion development in nurses (Dall'Ora et al., 2020). Among individual factors, the relationship between socio-demographic (e.g., gender, civil status) (Cañadas-De la Fuente, Ortega, et al., 2018; Gómez-Urquiza, Vargas, et al., 2017), occupational (e.g., work experience, work shift, working hours) (Gómez-Urquiza, Vargas, et al., 2017; Vargas et al., 2014) and job variables (workload, work-team climate, leadership style) (Cummings et al., 2018) and the development of emotional exhaustion has been highlighted. Younger age, female gender, being single or divorced, and not having children appear related to higher level of emotional exhaustion (Cañadas-De la Fuente, Ortega, et al., 2018; Gómez-Urquiza, Vargas, et al., 2017); moreover, nurses often have to routinely cope with stressful job situations such as rotating shifts and work overload because of understaffing. Role conflict and emotional demanding tasks positively contribute to emotional exhaustion (Vandenbroeck et al., 2017). Instead, co-workers and supervisors support can modify perceived job demands by providing informational and emotional support beyond actual help to the working activities (Chen et al., 2020; Velando-Soriano et al., 2020). Relational leadership styles such as transformational leadership are associated with improved outcomes for nurses and their work environments; instead, task-focused leadership styles such as abusive or authoritarian leadership are associated with lower job satisfaction, lower empowerment at work, and higher nurses' intent to leave (Boamah et al., 2018; Cummings et al., 2018). This suggests the leader's influence in shaping the experience of employees, including their experience of demands and resources, and maintaining a work and team climate conducive to the achievement of workers and organizational goals (Cummings et al., 2018).

Similarly, several factors at the work environment level including hospital ward type, model of nursing care, and development opportunities contribute to emotional exhaustion (Dall'Ora et al., 2020). Emotional exhaustion was suggested to vary across hospital services in relation to nurses' daily workload and emotional demands (Vargas et al., 2014). Some hospital ward type such as emergency medicine, general internal medicine and oncology are at higher risk of emotional exhaustion likely due to specific demands of the setting. Nurses working in an emergency unit are

exposed to hectic and unpredictable demands and have to cope with a broad range of diseases and injuries (Vandenbroeck et al., 2017); nurses working in internal medicine wards have to tackle with heavy workload with poor nurse-to-patient ratio that may increase the risk of missed nursing care (Gnerre et al., 2017); oncology nurses have to care for people who suffer from life-threatening diseases, and may be asked to communicate bad news, make ethically difficult decisions and cope with relatives' grieving processes (Cañadas-De la Fuente, Gómez-Urquiza, et al., 2018; Houlihan, 2015).

To date, the association between socio-demographic, occupational, job and work environment variables and the development of emotional exhaustion has been explored only at one level of aggregation, while evidence for associations at different aggregation level is lacking. Adopting hierarchical modelling techniques which allow one to analyse data including several aggregation levels can help to measure the relative contribution to and importance of individual- and work environment-level covariates in a way that represents a methodological improvement over standard regression model (Snijders & Bosker, 2011).

Therefore, the purpose of this study was to explore frontline nurses' perceived emotional exhaustion and associated factors that emerged during their clinical practice by employing a multilevel approach. The research question that guided this study was: "Which factors at the individual- and work environment-level affect frontline nurses' perceived emotional exhaustion?"

2. Methods

2.1. Design

A cross-sectional study design was performed between 2019 and 2020 and is reported here according to the STrengthening the Reporting of OBservational studies in Epidemiology (STROBE) guidelines cross-sectional studies (Appendix 1) (Von Elm et al., 2007).

2.2. Setting and participants

A North-west Italian tertiary hospital which provides care across four sites was involved. Nurses at each site were invited to participate after being informed about study aims and procedures. Participants were eligible when they a) worked in a ward with at least other two nurses; b) had at least 12 months of experience in the current ward; and c) were willing to participate in the study as expressed by answering the questionnaire. No restriction on specialty or education was applied.

2.3. End-point

The emotional exhaustion during clinical practice as perceived by nurses was the end-point of the study. The emotional exhaustion was assessed through the Oldenburg Burnout Inventory (OLBI) questionnaire, a 16-item validated tool that originally distinguishes an exhaustion (8 items) and disengagement dimension (8 items). For our study purpose, only the exhaustion subscale was administered. This subscale consists of four items positively framed and four items negatively framed to measure both ends of the continuum. Each item is recorded on a 4-point Likert scale (1 = strongly disagree to 4 = strongly agree; Demerouti et al., 2010). Positively framed items were reverse-coded when computing emotional exhaustion as mean.

2.4. Explanatory variables

Data were collected at the individual level and work environment level.

At the individual level the following variables were collected:

a) socio-demographic variables: age, gender, nursing education (diploma, bachelor degree, master degree), and post-specialization diploma (yes vs no);

b) occupational variables: time of the overall working experience (in years), time of the working experience in the current ward (in years), shift worker (yes vs no) and worked hours per week;

c) job variables:

(i) demands: workload - 4-item tool from the Job Content Instrument - (Bakker et al., 2004), cognitive and emotional job demands - Questionnaire on the Experience and Evaluation of Work, QEEW 2.0 - (Van Veldhoven et al., 2015), and role conflict - Copenhagen Psychosocial Questionnaire, COPSOQ - (Pejtersen et al., 2010);
(ii) resources: independence at work - QEEW 2.0 - (Van Veldhoven et al., 2015), role clarity - COPSOQ - (Pejtersen et al., 2010), meaning at work - Meaning at work (Ashmos & Duchon, 2000) and The work and meaning inventory (WAMI) (Steger et al., 2012) -, group closeness - The Inclusion of Other in the Self (IOS) Scale - (Aron et al., 1992);
(iii) self-concept: professional identity strength - 4-item tool from Professional Identity strength - (Kreiner & Ashforth, 2004), and relational and collective self-concept - Levels of Self-Concept Scale (LSCS) - (Selenta & Lord, 2005);
(iv) leadership variables: leader identity - Leadership Self-Identity Measure - (Hiller, 2005), liking - The Leader Affect Questionnaires (LAQs) - (Martinko et al., 2018), transformational leadership - The Global Transformational Leadership scale (GTL) - (Carless et al., 2000), abusive supervision - Abusive Supervision - (Tepper, 2000), and followers' satisfaction in their role - Followers' satisfaction in their role - (Gatti et al., 2015).

At the work environment level, our unit of analysis was represented by the hospital ward type (e.g. surgical, medical, emergency etc.) where each participating nurse was employed.

2.5. Data collection instrument and process

Study aim and procedures were preliminarily shared with the nursing managers responsible for the clinical areas across the four hospital sites. Then, all nurses were invited to participate in the study by an invitation letter presenting the study aims and methods.
A paper-and-pencil questionnaire was administered on one or more days according to the size of each ward and collected two weeks after the delivery. Two members of the research team were in charge of distributing and colleting the questionnaires. Each participant received a named pack containing: a) the information sheet; b) the questionnaire with an alphanumeric code that uniquely identified each participant; and c) a plain envelope to seal the questionnaire after it was completed. The filled questionnaire could be placed in a sealed box available in each ward or returned directly to the research members when questionnaires were collected according to participants' preferences.

2.6. Data analysis

Descriptive and inferential statistics were performed. First, frequencies, percentages and averages (with standard deviations [SDs] or confidence intervals [CIs] at 95%) were calculated. The Chi-squared test and *t*-test were used for comparisons between categorical and continuous variables, respectively. Pairwise deletion was employed to manage missing data. In this method, cases are excluded from operations in which data are missing on a variable that is required (Aycock & Hayat, 2020).
The end-point variable was computed as the mean. The end-point variable was considered a categorical variable in the bivariate analysis and a continuous variable in the multilevel analysis. For the bivariate analysis two groups were created: those nurses with a mean emotional exhaustion score higher than 2 out of 4 were defined as “emotionally exhausted”; and those with a mean emotional exhaustion score of 2 out of 4 or lower were defined as “not emotionally exhausted”.
A multilevel analysis by using the Generalized Linear Mixed Model was performed. Variables found to be significant on bivariate analysis were included in the multilevel analysis as well as forced variables that were deemed important to control for (e.g., clinical area). Estimates were calculated (γ, CI 95%).

In order to identify the cluster effect, the intraclass correlation (ICC) was computed both under random and fixed effect assumptions (i) at the unit level, assuming that some units can be characterized by greater group closeness and more relational-oriented leadership styles and (ii) at the work environment level, assuming different patients' care needs and demand of the setting according to the hospital ward type.
Statistical significance was set at 2-sided $p < 0.05$. Data were analysed using SPSS Statistical Package version 27.

2.7. Efforts to address potential sources of bias

To prevent selection bias, all nursing managers across the five hospitals sites were initially approached to share study aim and data collection procedure, and an open invitation was sent to all nurses who worked in the clinical area they supervised.
Several efforts were employed to avoid information bias by a) describing study aims and data collection procedures in the information sheet provided in each named pack; and b) guaranteeing nurses' freedom to participate with neither benefits nor pressure since research members responsible for distributing and colleting the questionnaires had no relationship with participants.
In order to maximize the response rate, when the questionnaire has not been filled at the time of collection, research members gave an informal verbal reminder and provided additional time.

2.8. Ethics

The study protocol was approved by the Ethical Committee of the University of Torino, Italy (no. 55631).
A written informed consent was not mandatory and the information sheet clearly stated that the participant provided the consent when answering the questionnaire.
One member of the research team (PG) stored the list matching alphanumeric codes to participants' name on her computer and on an external backup disk. This file was encrypted and was shared within the research team only after all questionnaires were entered into the data matrix and the matching list was destroyed.
Anonymity was ensured with regard to the participants and ward units.

3. Findings

3.1. Participants and end point

A total of 1556 (58.4%) out of the 2664 nurses invited to participate completed the questionnaire; 1539/1556 (98.9%) answered the questionnaire section about emotional exhaustion. Participating nurses worked across 147 wards, which belong to nine hospital ward types: surgical (n = 39), medical (n = 34), oncological (n = 14), neuroscience (n = 14), orthopedics (n = 13), cardiological (n = 13), emergency (n = 11), supportive services (n = 5, e.g., sterilization unit), and rehabilitative (n = 4). Nursing working group varied from three nurses (surgical, medical, oncological, neuroscience, cardiological, rehabilitative) to 34 (emergency).
Overall, 1262 (82.0%) nurses showed average scores on emotional exhaustion higher than 2.0 (out of 4) while 277 (18.0%) showed average scores equal or lower than 2.0 (Table 1).

3.2. Bivariate analysis

As reported in Table 1, at the individual level, nurses who felt emotional exhausted were more often female (83.6% vs 16.4%, p = 0.001). Among job variables, those nurses who felt emotional exhausted reported higher workload (3.60 [from 1, never to 5, always] vs 3.22, $p < 0.0001$), higher emotional job demands (3.15 [from 1, never to 4, always] vs 2.92, $p < 0.0001$), higher role conflict (3.15 [from 1 little to 5, very much] vs 2.76, $p < 0.0001$), and higher abusive supervision (1.46 [from 1, never to 5, always] vs 1.26, $p < 0.0001$); they also reported lower independence at work (2.99 [from 1, never to 4, always] vs 3.27, $p < 0.0001$), lower role clarity (4.20 [from 1, little to 5, very much] vs 4.43,

p < 0.0001), lower meaning at work (4.99 [from 1, strongly disagree to 7, strongly agree] vs 5.41, p < 0.0001), lower group closeness (4.12 [from 1, never to 7, always] vs 4.60, p < 0.0001), lower liking for the leader (2.51 [from 1, strongly disagree to 7, strongly agree] vs 2.85, p < 0.0001); lower professional identity strength (3.43 [from 1, strongly disagree to 5, strongly agree] vs 3.57, *p* = 0.010); lower collective self-concept (4.82 [from 1 never to 7 always] vs 4.96, *p* = 0.030), lower leader identity (2.51 [from 1 never to 7 always] vs 2.85, p < 0.0001), lower transformational leadership (4.37 [from 1, strongly disagree to 7, strongly agree] vs 4.97, p < 0.0001), and lower followership's satisfaction in their role (4.20 [from 1, strongly disagree to 6, strongly agree] vs 4.78, p < 0.0001).

At the ward type level, over 80.0% of nurses experienced emotional exhaustion regardless the ward type, except from supportive services where direct patients' care is not provided (Table 1).

3.3. Factors associated with emotional exhaustion

As reported in Table 2, at the individual level, female gender (γ = 0.179, 95% CI 0.079 to 0.278) was positively associated with emotional exhaustion, while master degree nurses were less emotional exhausted compared to nurses having a diploma (γ = −0.168, 95% CI -0.324 to −0.011).

Experiencing higher workload (γ = 0.141, 95% CI 0.101 to 0.180) and emotional job demands (γ = 0.166, 95% CI 0.112 to 0.220) increased emotional exhaustion. In contrast, experiencing higher independence at work (γ = −0.066, 95% CI −0.175 to −0.015), meaning at work (γ = −0.071, 95% CI −0.098 to −0.044), group closeness (γ = −0.034, 95% CI −0.051 to −0.017), and followers' satisfaction in their role (γ = −0.098, 95% CI −0.140 to −0.057) prevented from emotional exhaustion.

At the ward environment level, no difference in emotional exhaustion emerged across different hospital ward types (Table 2).

The ICCs at the unit level were 0.041 (random effects) and 0.039 (fixed effects); at the work environment level, they were 0.046 (random effects) and 0.052 (fixed effects). This indicates that around 3.9% and 5.2% of the residual variability can be attributable to each unit and hospital ward cluster.

4. Discussion

This study aimed to explore frontline nurses' perceived emotional exhaustion and associated individual- and work environment-level factors that emerged during their clinical practice by employing a multilevel approach.

Our findings showed over 80% of our nurses across different care settings who felt emotionally drained and lacked emotional resources. This is consistent with previous literature which showed an average prevalence of emotional exhaustion among nurses around 30%, that ranged from 10% to over 80% across several care settings, including pediatric (Pradas-Hernández et al., 2018), emergency (Gómez-Urquiza, De la Fuente-Solana, et al., 2017), oncology (Cañadas-De la Fuente, Gómez-Urquiza, et al., 2018) and medical area (Molina-Praena et al., 2018).

Our prevalence data is worrying since emotional exhaustion is known to be positively associated with organization turnover (Kelly et al., 2021) and intention to leave the profession (Alharbi et al., 2020; Havaei et al., 2016; Vandenbroeck et al., 2017). Keeping nurses in the profession is pivotal to provide high care quality, guarantee patient safety, and reduce organizational costs, and has been a challenging and debated issue since a long time (Guardini et al., 2012). The current global shortfall of 5.9 million nurses, in addition to 4.7 million new nurses who will have to be employed to replace those nurses who retire within the next 10 years, it results in a need of 10.6 million additional nurses by 2030 (Buchan and Catton, 2020; World Health Organization, 2020).

The COVID-19 pandemic has further exacerbated this global nursing shortage and highlighted the need to provide improved psychological support to nurses (Buchan & Catton, 2020). During the COVID-19 pandemic, the risk of psychological distress among healthcare professionals has been increased (Giusti et al., 2020; Tan et al., 2020) and particularly frontline nurses have been shown to

face enormous mental health challenges (R. Chen et al., 2021; González-Gil et al., 2021; Hu et al., 2020).

We found that all factors affecting nurses' perceived emotional exhaustion emerged at the individual level with prevalence of job variables. Our findings align with the JD-R model thereby when the work environment lacked resources, our nurses struggled to cope with high demands and were at higher risk to develop emotional exhaustion (Demerouti et al., 2001). We found that job resources were related to organizational (i.e., independence at work), psychological (i.e., meaning at work), and social (i.e., group closeness) aspects of the job, while job demands were physical and emotional in nature. Moreover, satisfaction in the role of follower also affected nurses' perceived emotional exhaustion.

Among the factors that hindered the development of emotional exhaustion, satisfaction in the role of follower had the greatest impact, followed by perceiving nursing profession as meaningful, feeling independent at work, and relational closeness with the nursing team.

Higher levels of nurses' satisfaction in their follower role were associated with lower emotional exhaustion. Thus, feeling comfortable with and gratified by the role of follower, and being satisfied with the contribution made as well as with working modalities, appear to prevent from emotional exhaustion. Relational leadership styles are more likely to empower followers and maximize their potential through intellectual stimulation, creativity, encouragement of innovation, understanding their needs, providing autonomy and fostering opportunity to participate in decision making (Boamah et al., 2018; Cummings et al., 2018; Mudallal et al., 2017).

Those nurses who perceived their work as important for their life and the well-being of the community, and experienced the work as a source of meaning which was functional in promoting their satisfaction and personal growth, understanding themselves better, and giving meaning to the surrounding reality, were less prone to report emotional exhaustion. It may be postulated that nurses with high degree of meaning at work were more likely to perceive job stressors as welcomed challenges that were worthy to invest energy (Wang et al., 2017).

When nurses felt free to choose and plan their own tasks, lower levels of emotional exhaustion were reported. Empirical research highlights that perceiving higher decision-making authority enables nurses to better manage job demands, thus reducing emotional exhaustion and in turn turnover intention (McKenna & Jeske, 2021; Mudallal et al., 2017). This is supported by the literature that shows job control (Spence Laschinger et al., 2012) and decision authority (Sullivan Havens et al., 2013) positively influence nurses' work engagement. Indeed, decisional involvement increases organizational commitment, and helps nurses to sustain their morale and feel satisfied with the profession (Labrague et al., 2017).

Lastly, increased social resources such as feelings of relational closeness with the nursing team and co-workers' support emerged as preventive factors from emotional exhaustion. At the workplace, literature suggests that social support may be provided formally by supervisors or informally by co-workers and includes emotional, instrumental, informational, and evaluative support (Shirey, 2004). Social support affects the response of individual to stress and was suggested to protect nurses against emotional exhaustion (Velando-Soriano et al., 2020) and psychological health problems such as depression and anxiety mainly by reducing the impact of job stress (Chen et al., 2020), our study shows a similar effect of relational closeness. In addition, social support from co-workers and supervisors can also promote nurses' personal meaningfulness at work (Blanco-Donoso et al., 2017). It seems that rewarding interpersonal interactions with co-workers favor feelings of psychological meaningfulness because such support helps to satisfy human needs of respect, dignity and feeling valued for their contributions (Vogt et al., 2016). The importance of interpersonal relationships has been previously emphasized and workplace interventions to improve group cohesion and communication have been recommended (van der Ploeg & Kleber, 2003).

Our findings highlighted the physical and psychological nature of nursing job demands, that consequently requires both physical and mental effort (Bakker & Demerouti, 2014). Our data suggest that high work overload and high emotional demands deplete nurses' resources and finally

lead to emotional exhaustion. Consistently with previous literature (Alharbi et al., 2020; Vandenbroeck et al., 2017), we found that unsatisfactory work conditions with heavy workload are important to nurses' emotional exhaustion. When nurses are exposed to high work demands and work under time pressure to meet deadlines, the risks of fatigue and psychosomatic distress increase (Adriaenssens et al., 2015). Moreover, nurses frequently confront with emotionally challenging situations which may arise negative feelings such as sadness, anxiety, guilt, shame, and also anger such as when they care for patients who are in the terminal stage of their illness and treatment is no longer possible (Ingebretsen & Sagbakken, 2016), when they have to reprimand patients who do not adhere to treatments or not follow recommendations (Jensen, 2017), and when tackling with organizational priorities which conflict with patient-centred care (Maffoni et al., 2020).
A few socio-demographic variables emerged with women being likelier than men to report emotional exhaustion while high education was associated with lower levels of emotional exhaustion.
Similarly to previous authors (Purvanova & Muros, 2010), female nurses reported higher levels of emotional exhaustion compared to their male counterpart and this could be explained by their social responsibilities related to home and family in addition to their professional responsibilities; indeed, finding the balance between managing job and child-rearing can be extremely stressful. Instead, consistently with previous literature (Baldonedo-Mosteiro et al., 2019; de Paiva et al., 2017), higher levels of education prevent from emotional exhaustion likely because nurses have more resources they can rely on when facing increased job demands.
Unexpectedly and in contrast with previous literature (de Paiva et al., 2017; Mudallal et al., 2017), levels of emotional exhaustion of our nurses did not vary across different ward types. The ward type-level was defined crucial to understand not only the individual's risk of being emotional exhausted, but also the group-level differences on the amount of emotional exhaustion. This postulation had not been confirmed by the small ICC at the work environment level, meaning that the possible hierarchical structure was not strongly relevant for the studied phenomenon. Previous results were only based on individual level data and could not have captured the group-level association with emotional exhaustion. This could have led to an overestimation of the association between hospital ward type and emotional exhaustion. Therefore, strategies to prevent emotional exhaustion among nurses should be develop and implemented across all clinical settings while tailoring interventions on the specific characteristics of each context.

5. Limitations

This study suffers from some limitations. Firstly, a cross-sectional design cannot confirm temporal and causal relations (Antonakis et al., 2010), even if previous literature and existing theories provide evidence that job demands and resources and leadership-related variables predict emotional exhaustion (Cummings et al., 2018; Dall'Ora et al., 2020; Demerouti et al., 2001). Secondly, some variables that may interfere with emotional exhaustion levels such as resilience, which has been suggested to be a protective factor against emotional exhaustion by leading individuals to positively face challenges, were not collected (Kelly et al., 2021). Thirdly, some socio-demographic variables that literature suggests to be related to emotional exhaustion such as civil status and having children were not explored (Cañadas-De la Fuente, Ortega, et al., 2018). Finally, although emotional exhaustion is considered the first step of burnout (Schaufeli & Buunk, 1996), we cannot state that this study identified predictors of this syndrome, since burnout has been conceptualized as a 3-dimensional condition where emotional exhaustion, depersonalization and personal accomplishment are strictly intertwined (Schaufeli et al., 2009).
Anyway, emotional exhaustion was investigated on a large sample of nurses across multiple clinical specialities and the adoption of hierarchical modelling techniques provided new insight in the investigation of this phenomenon. Moreover, the adoption of the OLBI questionnaire allowed for a

comprehensive assessment by exploring the affective but also physical and cognitive aspects of emotional exhaustion.

6. Conclusions

A large number of nurses felt to be emotionally exhausted. This suggests that emotional exhaustion continues to be a relevant problem despite the huge amount of literature which highlights this issue as the first step of a dynamic process leading to burnout with negative impact on patients' care quality and safety in addition to turnover and intention to leave the nursing profession, and argues for the urgent need of proactive measures.
Associated factors mainly emerged among job-related variables at the individual level, suggesting that emotional exhaustion is largely influenced by ward culture and organizational policies. Our findings indirectly draw attention to the positive role of collaborative culture at the ward level and the pivotal role of leadership in preventing emotional exhaustion by improving team climate and work climate. Leadership styles characterized by responsiveness and clear communication are more likely to promote trust among team members who will finally feel close and support each other both emotionally and instrumentally, and increase their satisfaction in the role of followers. Moreover, those leaders who promote autonomous decision-making also contribute to their colleagues' professional growth and strengthen their personal resources to better cope with job demands. Against organizational policies, our findings highlight the need to implement strategies to decrease workload such as improving the work schedule.
Differently, a few socio-demographic variables can help to pattern the risk profile for emotional exhaustion and design tailored preventive strategies to retain nurses in the profession. Our findings point out that female nurses are at higher risk of developing emotional exhaustion and therefore they need more psychological support; moreover, organizations should create the conditions to promote nurses' learning and development opportunities, since higher-educated nurses are less prone to emotional exhaustion likely because they are better equipped to tackle the challenges of the profession.
At the work environment level, hospital ward type does not affect emotional exhaustion. This suggests that emotional exhaustion may not be related to the clinical area profile, but rather it emerges as an intrinsic risk of the nursing profession due to the high physical and emotional demand.

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CRediT authorship contribution statement

Marco Clari: Conceptualization, Methodology, Formal analysis, Investigation, Resources, Data curation, Visualization, Writing - Reviewing and Editing. **Silvia Gonella**: Conceptualization, Methodology, Formal analysis, Writing - Original draft preparation, Visualization. **Paola Gatti**: Conceptualization, Investigation, Resources, Data curation, Writing - Reviewing and Editing. **Giacomo Garzaro**: Investigation, Resources. **Mario Paleologo**: Resources. **Claudio Giovanni Cortese**: Writing - Reviewing and Editing, Supervision, Project administration, funding acquisition. **Valerio Dimonte**: Writing - Reviewing and Editing, Supervision, Project administration.

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Table 1. Participants according to their perceived emotional exhaustion.

	Emotional exhausted (N = 1262, 82.0%) n (%)	**Not emotional exhausted (N = 277, 18.0%) n (%)**	**p-Value[e]**
Individual level			
Socio-demographic variables			
Age (n = 1214), years, mean (SD)	43.4 (9.1)	43.4 (9.4)	0.978
Female gender (n = 1247)	1042 (83.6)	205 (16.4)	0.001
Nursing education (n = 1517)			0.448
Diploma	660 (43.5)	141 (9.3)	
Bachelor degree	527 (34.7)	117 (7.7)	
Master degree	55 (3.6)	17 (1.1)	
Post-specialization diploma (n = 1517)	335 (22.1)	84 (5.5)	0.231
Occupational variables			
Length of the overall working experience (n = 1505), years, mean (SD)	20.7 (9.7)	20.4 (9.9)	0.696
Length of the working experience in this ward (n = 1369), years, mean (SD)	11.7 (8.3)	10.9 (8.6)	0.216
Shift worker (n = 1529)	977 (63.9)	220 (14.4)	0.447
Worked hours per week (n = 1489), hours, mean (SD)	37.1 (4.6)	37.5 (4.5)	0.216
Job variables			
Demands			
Workload (n = 1535), mean (95% CI)[b]	3.60 (3.55–3.64)	3.22 (3.12–3.31)	<0.0001
Cognitive job demands (n = 1536), mean (95% CI)[c]	3.69 (3.67–3.71)	3.68 (3.63–3.73)	0.836
Emotional job demands (n = 1536), mean (95% CI)[c]	3.15 (3.12–3.18)	2.92 (2.84–3.00)	<0.0001
Role conflict (n = 1535), mean (95% CI)[b]	3.15 (3.10–3.20)	2.76 (2.64–2.89)	<0.0001
Resources			
Independence at work (n = 1534), mean (95% CI)[c]	2.99 (2.96–3.03)	3.27 (3.20–3.33)	<0.0001
Role clarity (n = 1537), mean (95% CI)[b]	4.20 (4.17–4.24)	4.43 (4.36–4.51)	<0.0001
Meaning at work (n = 1534), mean (95% CI)[a]	4.99 (4.92–5.07)	5.41 (5.26–5.55)	<0.0001
Group closeness (n = 1515), mean (95% CI)[a]	4.12 (4.03–4.22)	4.60 (4.40–4.81)	<0.0001
Self-concept			

	Emotional exhausted (N = 1262, 82.0%) n (%)	Not emotional exhausted (N = 277, 18.0%) n (%)	p-Value[e]
Professional identity strength (n =1530), mean (95% CI)[b]	3.43 (3.38–3.47)	3.57 (3.47–3.67)	0.010
Relational self-concept (n = 1536), mean (95% CI)[a]	5.65 (5.60–5.69)	5.68 (5.58–5.78)	0.507
Collective self-concept (n = 1535), mean (95% CI)[a]	4.82 (4.77–4.87)	4.96 (4.85–5.07)	0.030
Leadership			
Leader identity (n = 1530), mean (95% CI)[a]	2.51 (2.43–2.60)	2.85 (2.66–3.03)	0.001
Liking (n = 1513), mean (95% CI)[a]	5.08 (4.98–5.17)	5.63 (5.45–5.81)	<0.0001
Transformational leadership (n = 1522), mean (95% CI)[a]	4.37 (4.28–4.46)	4.97 (4.78–5.16)	<0.0001
Abusive supervision (n = 1531), mean (95% CI)[b]	1.46 (1.42–1.50)	1.26 (1.20–1.31)	<0.0001
Followership's satisfaction in their role (n = 1515), mean (95% CI)[d]	4.20 (4.14–4.27)	4.78 (4.66–4.90)	<0.0001
Work environment level			
Hospital ward type (n = 147)			
Surgical (n = 39)	281 (81.4)	64 (18.6)	0.684
Medical (n = 34)	278 (83.2)	56 (16.8)	
Emergency (n = 11)	168 (80.4)	41 (19.6)	
Orthopedics (n = 13)	150 (82.0)	33 (18.0)	
Oncological (n = 14)	135 (81.3)	31 (18.7)	
Neuroscience (n = 14)	109 (84.5)	20 (15.5)	
Cardiological (n = 13)	71 (82.5)	15 (17.5)	
Supportive services (n = 5, e.g., sterilization unit)	35 (72.9)	13 (27.1)	
Rehabilitative (n = 4)	35 (89.7)	4 (10.3)	

CI, confidence interval; SD, standard deviation.
[a]On a 7-point Likert scale.
[b]On a 5-point Likert scale.
[c]On a 4-point Likert scale.
[d]On a 6-point Likert scale.
[e]Chi-square for dichotomous variables, t-test for continuous variables.

Table 2. Perceived emotional exhaustion: multilevel analysis.

	Estimate	Std. Error	t-Value	Pr (>|t|)	CI 95%	
(Intercept)	1.986	0.364	5.450	<0.001	1.225	2.748
Individual level						
Age, years	−0.00009	0.004	−0.023	0.981	−0.008	0.008
Female gender vs male	0.179	0.043	4.130	0.003	0.079	0.278
Nursing education						
Diploma	§					
Bachelor degree	−0.028	0.050	−0.577	0.569	−0.132	0.074
Master degree	−0.168	0.079	−2.121	0.036	−0.325	−0.011
Post-specialization diploma	−0.047	0.032	−1.439	0.151	−0.110	0.017
Overall working experience, length years	0.002	0.004	0.411	0.681	−0.006	0.009
Working experience in this ward, length years	0.00005	0.00005	1.040	0.299	−0.00004	0.0002
Shift worker	0.040	0.044	0.899	0.421	−0.085	0.165
Worked hours per week, hours	0.00002	0.0001	0.219	0.827	−0.0002	0.0003
Demands						
Workload[b]	0.141	0.020	7.015	<0.001	0.101	0.180
Cognitive job demands[c]	0.005	0.039	0.119	0.906	−0.072	0.081
Emotional job demands[c]	0.166	0.027	6.042	<0.001	0.112	0.220
Role conflict[b]	0.030	0.017	1.750	0.080	−0.004	0.064
Resources						
Independence at work[c]	−0.066	0.026	−2.528	0.012	−0.117	−0.015
Role clarity[b]	−0.031	0.026	−1.174	0.241	−0.083	0.021
Meaning at work[a]	−0.071	0.014	−5.080	<0.001	−0.098	−0.044
Group closeness[a]	−0.034	0.009	−3.946	<0.001	−0.051	−0.017
Self-concept						
Professional identity strength[b]	0.021	0.020	1.073	0.283	−0.018	0.060
Relational self-concept[a]	0.044	0.024	1.817	0.102	−0.011	0.099
Collective self-concept[a]	0.013	0.029	0.460	0.656	−0.051	0.078
Leadership						
Leader identity[a]	−0.019	0.010	−1.877	0.061	−0.040	0.0009

	Estimate	Std. Error	t-Value	Pr (>|t|)	CI 95%	
Liking[a]	−0.001	0.002	−0.538	0.638	−0.009	0.007
Transformational leadership[a]	0.001	0.012	0.115	0.909	−0.022	0.025
Abusive supervision[b]	0.031	0.028	1.124	0.261	−0.024	0.087
Followership's satisfaction in their role[d]	−0.098	0.020	−4.971	<0.001	−0.140	−0.057
Work environment level						
Hospital ward type						
Supportive services (e.g., sterilization unit)	[§]					
Surgical	0.237	0.324	0.730	0.494	−0.569	1.042
Medical	−0.003	0.322	−0.008	0.994	−0.789	0.784
Emergency	0.177	0.338	0.524	0.617	−0.632	0.986
Orthopedics	0.551	0.343	1.607	0.158	−0.283	1.385
Oncological	0.018	0.347	0.053	0.960	−0.840	0.878
Neuroscience	−0.141	0.334	−0.422	0.687	−0.940	0.658
Cardiological	0.122	0.360	0.338	0.746	−0.752	0.995
Rehabilitative	0.095	0.378	0.251	0.811	−0.846	1.036

Legend. CI, confidence interval; Std. Error, standard error.
[§]Reference group.
[a]On a 7-point Likert scale.
[b]On a 5-point Likert scale.
[c]On a 4-point Likert scale.
[d]On a 6-point Likert scale.

Appendix 1. STROBE checklist

	Item no	Recommendation	Page number
Title and abstract	1	(*a*) Indicate the study's design with a commonly used term in the title or the abstract	1
		(*b*) Provide in the abstract an informative and balanced summary of what was done and what was found	1
Introduction			
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported	1–3
Objectives	3	State specific objectives, including any prespecified hypotheses	3
Methods			
Study design	4	Present key elements of study design early in the paper	3
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection	3
Participants	6	(*a*) *Cohort study*—give the eligibility criteria, and the sources and methods of selection of participants. Describe methods of follow-up *Case-control study*—give the eligibility criteria, and the sources and methods of case ascertainment and control selection. Give the rationale for the choice of cases and controls *Cross-sectional study*—give the eligibility criteria, and the sources and methods of selection of participants	3
		(*b*) *Cohort study*—for matched studies, give matching criteria and number of exposed and unexposed *Case-control study*—for matched studies, give matching criteria and the number of controls per case	Not applicable
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable	3–5
Data sources/measurement	8[a]	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group	3–5
Bias	9	Describe any efforts to address potential sources of bias	6
Study size	10	Explain how the study size was arrived at	Not applicable

	Item no	Recommendation	Page number
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why	5
Statistical methods	12	(*a*) Describe all statistical methods, including those used to control for confounding	5
		(*b*) Describe any methods used to examine subgroups and interactions	5
		(*c*) Explain how missing data were addressed	5
		(*d*) *Cohort study*—if applicable, explain how loss to follow-up was addressed	
		Case-control study—if applicable, explain how matching of cases and controls was addressed	Not applicable
		Cross-sectional study—if applicable, describe analytical methods taking account of sampling strategy	
		(*e*) Describe any sensitivity analyses	Not applicable
Results			
Participants	13[a]	(a) Report numbers of individuals at each stage of study—e.g. numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed	6
		(b) Give reasons for non-participation at each stage	3
		(c) Consider use of a flow diagram	Not applicable
Descriptive data	14[a]	(a) Give characteristics of study participants (e.g. demographic, clinical, social) and information on exposures and potential confounders	6, Table 1
		(b) Indicate number of participants with missing data for each variable of interest	Table 1
		(c) *Cohort study*—summarise follow-up time (e.g., average and total amount)	_
Outcome data	15[a]	*Cohort study*—report numbers of outcome events or summary measures over time	_
		Case-control study—report numbers in each exposure category, or summary measures of exposure	_
		Cross-sectional study—report numbers of outcome events or summary measures	7, Table 2
Main results	16	(*a*) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (e.g., 95% confidence	7, Table 2

	Item no	Recommendation	Page number
		interval). Make clear which confounders were adjusted for and why they were included	
		(*b*) Report category boundaries when continuous variables were categorized	Not applicable
		(*c*) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period	Not relevant
Other analyses	17	Report other analyses done—e.g. analyses of subgroups and interactions, and sensitivity analyses	5, Table 1
Discussion			
Key results	18	Summarise key results with reference to study objectives	8–9
Limitations	19	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias	11
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence	9–11
Generalisability	21	Discuss the generalisability (external validity) of the study results	12
Other information			
Funding	22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based	12

Note: An Explanation and Elaboration article discusses each checklist item and gives methodological background and published examples of transparent reporting. The STROBE checklist is best used in conjunction with this article (freely available on the Web sites of PLoS Medicine at http://www.plosmedicine.org/, Annals of Internal Medicine at http://www.annals.org/, and Epidemiology at http://www.epidem.com/). Information on the STROBE Initiative is available at www.strobe-statement.org.

[a]Give information separately for cases and controls in case-control studies and, if applicable, for exposed and unexposed groups in cohort and cross-sectional studies.