Chapter 3

Stress in Nursing University Students and Mental Health

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Additional information is available at the end of the chapter

http://dx.doi.org/10.5772/intechopen.72993

Abstract

Stress is a physiological response that impacts the cognitive, emotional, behavioral, and social components. It also involves the adaptation of the organism, the coping resources, and the environment. In young people, stress can be triggered by social interactions or school requirements. This chapter is a narrative review analyzing scientific bibliography from the main databases (NIH, Scielo, Redalyc) that explored the main stressors and their effects on nursing students. These stressors include the care of patients, assignments and workloads, academic evaluations, and negative or hostile social interactions. Data include the deleterious effects of stress in nursing students as anxiety, depression, inhibiting learning, and burnout, which negatively impact their academic development and health. Finally, some interventions to reduce the impact of stress are discussed. Conclusion: Stress responses in nursing students vary in duration and intensity during their academic training; final effects depend on the coping mechanisms, individual resources, and hospital environment. The effects of stress on nursing students impact on academic performance but could also trigger several psychiatric disorders as depression or anxiety, as well as other associated problems such as sleep disorders, alcohol, and psychoactive drug consumption, which in the short and long term may affect the patient care.

Keywords: nursing students, stress, psychiatric disorder, scholar stress

1. Introduction

The term stress comprises the physiological and psychological responses that prepare the organism to cope with stimulus called stressors that are interpreted as challenging to the individual [1]. Deleterious effects of stress have been observed from the first scientific description of stress by Selye [2]. Traumatic events can trigger intense stress response on the organism,

while daily routines as job, economical, or academic pressures can elicit mild responses of stress during prolonged periods of time; in both cases, stress responses can be altered producing deleterious effects on health [3]. Although today the concept of stress has been extensively used and discussed, at least two different perspectives of stress must be mentioned: one is organic and the other is psychological [4]. **Table 1** shows the main similarities and differences of these two perspectives.

Another point of view proposed that stress occurs due to demands that exceed individual resources, affecting the adaptive, cognitive, and emotional capacities of the subject [5]. From this perspective, psychological stress has three types of cognitive assessments. In the first cognitive evaluation, the subject discards or recognizes the threatening, beneficial, or insignificant situations based on personal beliefs, self-efficacy, goals, and situational factors. In the secondary cognitive evaluation, the subject estimates the own resources of coping, including the skills to change the situation or reducing the aversive impact. In the last cognitive stage, the subject perceives and reinterprets the stressful situation; that is, there is a reevaluation of a situation that originally was considered threatening and is reinterpreted as benign. In nursing students, stress can be produced when the demands are perceived as excessive and uncontrollable, and its effects are related to health problems [6, 7]. **Table 2** describes the classification and impact of stress on health.

Another theoretical perspective on stress is Neuman's model, which considers stress as the product of the instability of a client system (individual-environment-staff), in which stressful elements join in [9–12]. Although some stimuli that are generated within the limits of the client's system are stress-producing, they trigger a result that can be positive or negative; it makes necessary to explore the results that stress produces in nursing students during academic training. The stressors that nursing students face daily would be the following: (a) Intrapersonal forces occur within the individual, such as conditioned responses, thoughts, and sensations. (b) Interpersonal forces refer to negative relationships between students, patients, and staff, e.g., the expectations of the patient or student about the role in a hospital. (c) Extra-personal forces occur outside the individual, such as the student's economic circumstances [9, 10]. Thus, interventions to reduce stress should be routed in three directions. The goal of primary prevention is to reduce the possibility of facing a stressor or reduce the possibility of a reaction. In secondary prevention, intervention is made after the client responds to

Perspective	Differences	Similarities
Organic	Stress like an uncontrolled response by the organism that can be pleasant or unpleasant	Stress as an adaptive process and the development of the organism's abilities
Psychological	Stress seen as a process of transaction between environment and individual that is emphasizing the cognitive part and the response of the organism to the stimulus, not only by physiological reactions	

Adapted from: Holahan [4].

Table 1. Perspectives of the concept of stress.

Kind	Description	Impact on health	Examples
Acute	It comes in daily life environment, is short in duration, and has no severe effects on health. This type of stress helps the individual develop coping skills	Emotional agony; muscle, stomach, and intestinal problems; and transient over-excitation	Loss of a loved one
Episodic	This type of stress is intense and repetitive without being established as chronic	Prolonged agitation, severe and persistent headaches, migraines, hypertension, chest pain, and heart disease	Individuals with personality type A (DSM-V) and people who develop in hostile environment
Chronic	Intense, repetitive, and exhausting and leads to the development of diseases	Violence, nervous breakdowns, heart attacks, strokes, cancer, and even suicide	Traumatic experiences of childhood and suffering some illness

Adapted from: Herrera [8].

Table 2. Classification of stress.

the symptoms of stress. The customer's internal and external resources are used to reinforce internal resistance, reduce reaction, and increase resistance factors. Tertiary prevention takes place after active treatment or the secondary prevention phase; it aims to ensure that the patient recovers the optimal stability of the system in Neuman's model [9, 11, 12].

In summary, stress should be seen as the result of the interaction between the environment and the individual; in the case of nursing students, the specific stressors are related to factors of academic life and hospital practices, which are often intense, repetitive, and exhaustive (see **Figure 1**).

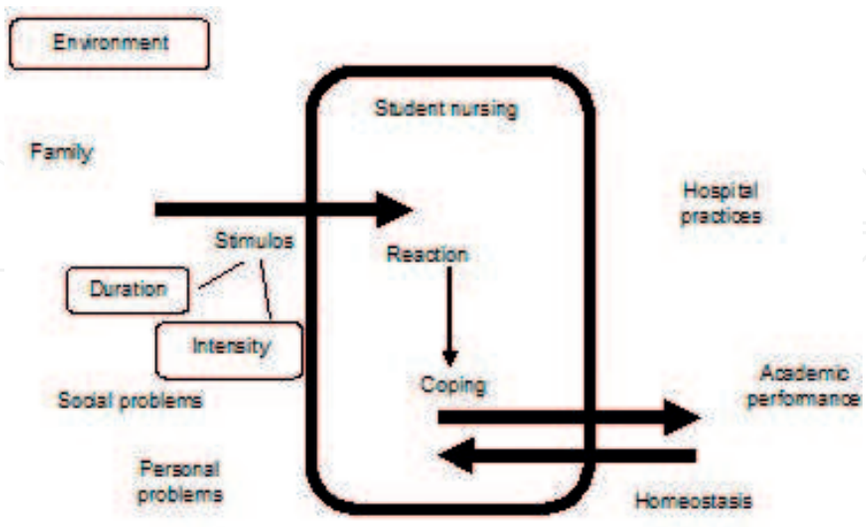

Figure 1. Model stress in nursing student. Note: This figure illustrates the interaction between the nursing student and the stressors.

2. Stress and health in nursing students

Exploring the effects of stress in students is important in many aspects, but two are outstanding. First, most of the students are young, and the effects of stressful events in young can last until adulthood, increasing the risk of suffering mental health disorders [13, 14] among other risks on health [15]. Mental health in nursing students will be reviewed in Section 5. Second, stress can reduce learning skills [16] indispensable in academic environments; the reduction of learning skills is a factor of great importance since it reduces the resources of students to achieve academic success. It is known that stress is triggered by stimulus according to the age of the person [17]. In this sense, school environments can expose individuals to stressors as harassment by peers, schoolwork pressure, and being treated careless by teachers; all these stressors can be severe enough to produce psychosomatic pain, psychological complaints such as feeling unsafe and nervous, irritability, sadness, and depression [18, 19]. The effects of stress in school can negatively impact social dynamics between peers and teachers, and these in turn can produce more stress that in consequence triggers mental health problems such as anxiety and depression [20, 21].

Prevalence of academic stress is very high in health students, especially in nursing and medicine students according to several reports [22–26]. Thus, the importance of studying the stressors in nursing students lies in the deleterious effects on cognitive performance and health, i.e., the development of mental disorders such as depression, anxiety, eating disorders, sleep, and substance use [27], but also experience of stress can result in students experiencing ineffective communication and inefficient at work, decreasing the quality of health-care services [24].

3. Social stressors in academic life

Social stressors affecting nursing students can be grouped according to the experience of formative knowledge and applied knowledge. Formative knowledge element refers to the academic life of the nursing student. In a study that included 81 postgraduate students in full-time and part-time nursing in Jamaica, the authors found that 50% of participants indicated experiencing the moderate level of stress related to the program of study. The highest stress scores were related to the preparation, the final result of the exams, and the academic load of the student [28]. These findings are similar to those found in Latin American students, in which 89 students of nursing from Lima (Peru) reported in 2005 excessive academic workload, academic test, and lack of time to complete academic assignments as the main stressful stimuli during training [29].

Regarding the styles of coping stress, according to a longitudinal research with 249 Spanish nursing students, there exist differences between coping styles related to sex, being women who use more an emotional coping approach than men, while male students tend to use more behaviors as alcohol and drug consumption to cope with stressful situations. Surprisingly, the emotional coping observed was positively correlated with neuroticism and negatively with friendliness and scrupulousness.

Finally, the authors demonstrated that nursing students experienced an adaptation to the stressful events during academic life when comparing last year students with the first year nursing students [26]. Similarly, stress and resilience scores in a cohort study of 1538 undergraduate nursing students in China showed an influence of academic progress (years) on the stress scores; senior students reported lower stress scores compared to less advanced students [30]. Also, a cross-sectional study of 474 nursing students from three different universities in China found high scores on two subdimensions of the stress role scale: role of conflict and role of ambiguity. This means that the main cause of stress is because most students have no idea what activities they are going to do during their stay in the hospital. Additionally, the authors demonstrate that when the student has a very well-defined identity as a nurse he or she tends to have low scores of stress [31].

When students experience applied knowledge, stressful situations are mainly related to the nurse–patient interaction, which implies specific care according to the illness and needs of the patient, in addition to the application of knowledge and skills during nursing practices (see Section 4.1). For example, a qualitative study analyzed seven Iranian nursing students and found that the social environment of hospitals is stressful enough during their first practices, where students experience feelings of being inefficient, followed by being ignored, and also experience ineffective communication, sadness, and ambiguity of the activities they are assigned to do [24]. Additionally, experiencing the death of a patient is considered an extremely stressful situation for nursing students [32]. In another example, using an adaptation of the Student Nurse Stress Index (SNSI) to Turkish nursing students, it has been found that there are four stressors in students: academic load, clinical concerns, personal problems, and interface worries. The factor with greater influence was the personal problems of the patients, while the factor with the lower influence was the academic load. This means that the problems related to the patient tend to be more stressful than some other stressors [33].

Besides, it has been shown that the sense of self-efficacy is positively correlated to active coping styles as planning, positive reinterpretation of the context, acceptance of the event, and emotional support during the first clinical practice; all these are observed in 394 polish students during the first year of the career. This means that the student tends to experience less stress when they feel ready to successfully perform a procedure to the patient. In the same way, people with low perceived stress tend to have a high sense of self-efficacy [34].

In all previous studies, the stress levels were increased when the student started clinical practicing, i.e., the application of knowledge and ethical and legal responsibility about the care of the patient; this stress response can differ according to individual differences. One of those differences seems to be gender, as shown in a research in which 215 nursing students from Murcia showed that women had higher stress scores than men during clinical practice, in subjects related to emotional items (contact with the suffering of others, emotional implications with the patient); these findings do not mean in any sense that women are less prepare to cope with stress, but women are probably more empathic with the patient. Likewise, there is a statistically significant relationship between age and subjects experiencing impotence or uncertainty in a given situation, excessive overload of work, and lack of knowledge of a clinical situation, especially in students under 21 years of age [35]. In contrast, in a study that included

45 students of the University of Murcia, it was found that men get more stressed than women; this statistically significant difference between both sexes was present on the topics related to the management of new technologies, contact with the suffering of others, not knowing how to control the relations with the patient, and the concern about the results of the evaluation in practice [36]. In short, the first professional practices like social service prove to be more stressful for nursing students than theoretical training because student are required to put into practice all the acquired knowledge and skills in a real context. So, experience stress during nursing practice could be due to a possible discrepancy between curricula and practice, in addition to the structural conditions found in most Latin American hospitals [37, 38].

Another social factor producing stress in students can be related to cultural differences due to nationality or cultural identity. Ethnically, diverse nursing graduate students, including Latin, have reported difficulties to adapt in school due to cultural differences during academic life in foreign countries; that is, these students felt the need to validate their capacities and skills to others, based on the fact that native students recognized their differences as evidenced by skin tone or language. In these cases, feelings of isolation and marginalization are experienced when the environment do not recognize their cultural identity. These students tend to feel they are not socially integrated or fully accepted, which causes stress and increases the probability of attrition and desertion [39, 40]. In the same study, protector factors against the stress produced by cultural differences, such as services of financial aid that alleviates monetary worries, social activities, assignment of a faculty mentor, achievement, or progress of academic goals, were also identified [40]. All these supports findings reported in Mexican American students that related academic success with financial assistance, bicultural relations, and experiencing authentic caring relationships from institutional agents, family, and peers [41].

4. Neuroendocrine responses in stressed nursing students

Research about the effects of stress on nursing students has been developed since the early 1970s; nevertheless, the effects on the hormone levels and other physiological functions in nursing students have been scarcely reported until now [42]. Stress hormones, i.e., cortisol, are produced by hypothalamic-pituitary-adrenal axis. The paraventricular nucleus of the hypothalamus produces corticotropin-releasing hormone (CRH), which in turn stimulates the pituitary to produce adrenocorticotropin (ACTH). Then, ACTH stimulates the adrenal cortex to secrete cortisol in order to increase energy availability [15, 43], but in a long term, this response can be deleterious. On healthcare professionals, the explored deleterious effects of stress on physiological status comprise alterations on energetic metabolism and body mass [44]. Additionally, stress hormones impair plasticity in the hippocampus of animals [45] and human beings, affecting learning skills [16] and contributing to the development of pathologies as anxiety and depression [46, 47]. For these reasons, the study of physiological effects of sustained high stress hormones in nursing students is a key factor to understand the deleterious effects of stress. In this sense, measures of salivary cortisol seem to be useful to explore the effects of different environmental stressors and anti-stress interventions [48].

4.1. Stress-related cortisol response in nursing students

Studies of cortisol levels in nursing students have been performed under several circumstances in which students are exposed to different kinds of stressors. For example, 21 nurse anesthesia students were tested on salivary cortisol levels during 3 days for baseline measures; after that, 16 continued the experiment and experienced a session of *high-fidelity patient simulation* used for training students on the contact with patients. The simulation was carried on in the presence of evaluators. Results showed a significant increase of cortisol levels of students after experiencing the simulation, in which cortisol levels were threefold higher than the control [49]. Another study explored the effects of social factors on stress responses by exposing final semester nursing students to *high-fidelity patient simulation* under three different circumstances: low anxiety (patient was a Laerdal© *advanced life support* [ALS] manikin, additionally an actor played as a registered nurse), medium anxiety (the patient and a registered nurse were actors), and high anxiety (patient and registered nurse actors were accompanied by a visiting and inquisitive friend [actor] that asked questions from a standardized script as "Why do you have to flush the line?" and "When do you think I can take him out of here?"). Students from the group of high anxiety had higher changes in heart rates and levels of cortisol when compared to the low anxiety group [50]. These findings show that stress in students can be modulated through different factors, including social interactions. It is also important to control the levels of stress during simulation, since the effects of stress on learning in nurse students during simulations are still not clear enough [51].

Additionally, nursing students are required to complete clinic practice; this process often implies covering night shifts. It has been documented that night shifts in nurses are stressful enough to alter the circadian rhythm of cortisol secretion after 5 days when compared to nurses with day shifts. At least 2 days off seem to be necessary to restore the circadian rhythm of cortisol [52]. Moreover, in a Brazilian study, nurses (46 females, 11 males) had higher levels of salivary cortisol (564.1 ng/mL) on work day than cortisol levels (354.1 ng/mL) on days off [53]. These data should be taken carefully since samples were collected by participants itself under different uncontrolled circumstances, and values reported in abstract are different to values reported on tables. It is logical to assume that nursing students doing clinical practice under night shifts and high workload are vulnerable to changes in cortisol patterns, and then night shifts and workload are other stressors that may be affecting health in nursing students.

On the other hand, measures of cortisol obtained from 26 female nursing students in the fourth year of school in Osaka showed that salivary cortisol (μg/dL) did not significantly change 10 min before an academic examination (0.148 ± 0.024), immediately after the examination (0.156 ± 0.037), and 2 h after the examination (0.102 ± 0.034) [54]. In contrast, the same study found increases of salivary immunoglobulin A (IgA) and salivary chromogranin A (CgA) in response to the stress of examination. This finding contrasts with other studies in which salivary cortisol levels changed in response to examination in junior and senior nursing students [55]. Plasma cortisol levels were also measured in 92 female nursing students (19–21 years old) from Suzhou Health College under school and clinic conditions during a month. Although results of this study suggested a modest increase of anxiety in clinic conditions measured with the State Anxiety Inventory (SAI), cortisol levels did not vary significantly [42]. Authors suggest that plasma cortisol could be a good marker for acute stress but not for the chronic

effects. All together, these findings suggest that salivary cortisol measures in healthy nursing students vary according to the kind of stressor and the schedule of exposition.

Finally, in a study on 69 health professionals from a palliative care unit, including 32 nursing assistants and 30 nurses that met the burnout criteria with the *Maslach Burnout Inventory-Human Services Survey* (MBI-HSS), the average levels of salivary cortisol in the group with one dimension of burnout (14.17 nmol/L) were higher than non-burnout group (8.83 nmol/L) [56]. High levels of salivary cortisol are also observed in nursing students with high scores of depression, anxiety, and stress [46]. These findings suggest that cortisol is a useful biomarker of emotional health deterioration due to stress in nursing students and professionals.

4.2. Effects of anti-stress interventions on endocrine responses of nursing students

Several anti-stress interventions have been implemented with the aim to reduce stress in nursing students and professionals, but most of these works are based in self-reports of a decrease in symptoms of stress, and they lack of physiological measures as stress-related hormones. In this sense, few works have explored the effects of anti-stress manipulations on endocrine responses in students to test the efficacy of these interventions. For example, nursing students (16–20 years old) from a nursing college in Taiwan which have scored 8 points or higher on the *Depression Mood Self-Report Inventory for Adolescence* (DMSRIA) were randomly assigned to a control group (n = 40) and an experimental group (n = 31) that was exposed to Chinese five-element music for 40 min twice a week for 10 weeks. Saliva samples were collected before music exposure and during weeks 1, 5, and 10 of music at 11 am. Music treatment reduced cortisol levels on weeks 5 and 10; however, these changes did not reach statistical significance [57]. It is also important to note that music was played in a group setting, while control groups had no manipulation; thus, the effect of music cannot be isolated from any possible effect of being part of a group when listening to the music, a possibility that remained to be explored.

It has been reported that physical activities can ameliorate the impact of stress. For example, 18 nursing students who practiced a traditional Chinese exercise called Qigong twice a week for 10 weeks had lower scores of depression, anxiety, or stress than 16 control students interviewed with questionnaires DASS-21 and PHQ. This improvement was related with a decrease in salivary cortisol concentrations [46], which agrees with the beneficial effects of exercise in the brain functions at the preclinical level [47].

Taken together these findings suggest that cortisol is not strongly correlated to the stress experienced by nurses or nursing students in different circumstances. Studies from other healthcare professionals point out the same findings. In physicians and paramedics, cortisol showed very little variation in response to the stress produced in high-fidelity patient simulation used for training, while salivary alpha-amylase appeared to be more sensitive than salivary cortisol to measure stress in a simulated prehospital environment [58].

5. Stress and mental disorders

Mental illnesses are a health problem with high prevalence in the young adult population [59, 60]. Within this population, students are highly vulnerable, especially in the areas of health sciences.

Careers as medicine, dentistry, and nursing are very demanding physically, intellectually, and emotionally for the students, who are exposed to high levels of stress during their formation. Particularly, in the last year of student training, they are exposed to severe emotional stress and exhaustion. The stressors they face come from different ways such as academic factors, the demands of proper performance in clinical practice, academic assessments, and future expectations about employment [60]. In addition, social, emotional, and physical pressures, as well as family and personal problems, affect student's learning ability and academic performance [61] and predispose the young students to the development of mental disorders such as anxiety and depression [62–64]. The impact of stress on nursing students can affect the nurse–patient relationship; nurses have more interaction during and after an intervention with the patient. Similarly, being exposed to environmental stressors could lead to dissatisfaction and burnout in nursing staff [65–67].

It is estimated that up to 55% of young adults report depressive symptoms, burnout, and increased frequency of alcohol consumption during their life as student [68, 69] and about 42% of students develop a mental disorder, a situation that predominates in the female gender with a prevalence of 62% of this population, with an average age of onset of 23.5 years [70]. The most common mental disorders affecting students are anxiety disorders, particularly in women [60], and they also report higher levels of stress than men [71]. Seventy-five to ninety percent of medical students, including nursing, increase alcohol and tobacco consumption particularly in the last year of their medical education [72]. Most of the cases (72%) feel a state of emotional well-being that helps to cope with the experienced psychological stress they are exposed to, despite being aware of the consequences of excessive alcohol and tobacco consumption [72]. Something similar has been reported in nursing students, where stress, environmental influences, social acceptance, and easy availability of alcohol, as well as anxiety generated by the difficulty of the educational program, are factors that increase alcohol consumption in this population [73]. In the general population of these students, 44.4% report feeling emotionally stressed and develop some mental disorder.

On the other hand, subjects exposed to stressors but with a network of emotional support reported feelings of happiness; so, it is suggested that support networks help to decrease susceptibility to develop mental disorders [70]. The absence of such emotional support networks in students increases the risk of developing some mental disorder; students reported having some physical illness or mental disorder diagnosed by a psychiatrist with no significant differences on prevalence between careers of the health science, such as medicine, dentistry, and nursing [70]. Additionally, it has been observed that factors such as religious practice are a potential factor for resistance to mental disorders, such as alcoholism, anxiety, depression, suicide rate [74, 75], and burnout [68].

These data support the idea that there is a strong relationship between the physical and psychosocial stresses to which nursing students and other health careers are exposed, with the susceptibility to develop some mental disorder, and that the presence of some religious beliefs and social support networks, such as the family, diminishes the susceptibility to the development of such disorders.

6. Conclusion

There is plenty of evidence that nursing students are exposed to high levels of stress during their preparation. Among the most frequently stressors mentioned in literature are excessive

workload, lack of time to accomplish academic assignments, test, interaction with patients, and negative interactions with peers and family. At the academic level, the stressors can be the result of a gap between the academic preparation and the practical training or the environments produced in universities and hospitals. In this sense, the educational models must contemplate simulations of the real life that the students will face at work. Such programs must also include the development of social, emotional, coping, and buffering skills. Levels of stress on nursing studies are strong enough to change secretion of cortisol with potential deleterious effects. Physical and psychosocial stress in nursing and healthcare students increased susceptibility to develop some mental disorder, and social support networks diminish the susceptibility to the development of such disorders. Thus, stress must be considered during the formation of nursing students to optimize their academic performances and avoid deleterious effects.

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