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Evaluation of cognitive characteristics among nurses of Al-Zahra Hospital in Isfahan in terms of demographic variables

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ABSTRACT

Cognitive failures are one of the main reasons for nurses reduced patient safety in hospitals. The current study was aimed to investigate the cognitive failure characteristics in nurses of Al-Zahra Hospital in Isfahan. For this purpose, a cognitive failure questionnaire was designed to nurses working in this treatment unit. After analyzing the data obtained from the questionnaires, the Mann-Whitney test and Kruskal-Wallis test were used to analyse whether two samples are likely to derive from the same population. Based on the results of the Kruskal-Wallis test, there was no significant difference in the average of cognitive failure between different age groups (χ^2=4.77, p=0.18), different wards (χ^2=3.47, p=0.62), different employment statuses (χ^2=0.16, p=0.92), and different work experiences (χ^2=0.63, p=0.72). There was no significant difference between having a chronic disease and not having a chronic disease (Z=-0.93, Sig.=0.35) according to the results of the U Mann-Whitney test, in terms of the average of cognitive failure statistically, between male and female nurses (Z=-0.77, Sig.=0.43), single and double occupational nurses (Z=-0.59, Sig.=0.55), nurses with different education (Z=-0.38, Sig.=0.702), different working hours (Z=-0.65, Sig.=0.51), being under psychiatric treatment and not being under psychiatric treatment (Z=-0.20, Sig.=0.83), the experience of mental illness in the last 6 months and the absence of such experience (Z=-0.53, Sig.=0.59). According to the results of the present study, the studied parameters did not have a significant effect on the incidence of cognitive failures. Therefore, they did not play a role in the occurrence of disorders in thinking, concentration, and attention of nurses. Thus, the cognitive failures that occurred in Al-Zahra Hospital were mostly related to other parameters.

KEYWORDS: *Cognitive failure, Demographic characteristics, Patient safety level, Nurses' vigilance, Occupational safety*

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INTRODUCTION

Cognitive failures indicate the frequency of cognitive-based errors that occur in tasks that a person can usually perform without difficulty or error [1, 2] and they act as personality traits characterized by distraction and inattention [2, 3]. Workplace cognitive failures are cognitive processing workplace failures that previous research has shown to be associated with safety incidents [4-6]. Given the negative consequences of cognitive failures, especially in workplace, researchers investigated the experiences of work cognitive failures, such as family involvement in work [7, 8], more tasks [5] and personality traits such as nervousness [5], and low conscientiousness [5, 9-11]. Work-family conflict refers to the negative impact that works and non-work areas may have on each other due to their incompatible desires [7, 12]. However, work-family conflict was recognized as reciprocal. So that, job demands can disrupt family responsibilities and vice versa. Family interaction with work had stronger consequences on employees' work behaviours, including performance and absence copared to work-family interaction. In addition, Cullen and Hammer [13] found that family involvement in work was negatively related to employees safety behaviours [7]. People with higher conscientiousness should also pay more attention to work tasks and as a result, do not commit many cognitive failures. In addition, cognitive failure in the workplace should be positively associated with nervousness, as these individuals were prone to experience stress, fear, and disgust that may put them at greater risk for engaging in extracurricular behaviours [5]. According to the study conducted by Oud et al., [14], there was no relationship between cognitive impairment, depressive symptoms, and the number of hospital readmissions or deaths in a short time. Elfering et al., [15] also proved that compliance with safety regulations was significantly associated with cognitive failure and near-accident. Pereira et al., [16] showed that disruption of workflow and social stress caused by the supervisor in the workplace can directly lead to cognitive failure of surgical staff. According to Holbrook et al., [17], in examining the relationship between demographic characteristics and cognitive failure of nurses, the level of cognitive functions decreases with age. Ageing increases sleep disorders and can lead to drowsiness. A study by Machado et al., [18] showed that the workload of nurses working in 24-hour shifts in the ICU was associated with high levels of stress, attention deficit, and psychomotor reduction. Stressors during nursing create many needs for cognitive control and therefore may increase the risk of cognitive failures that put patients at risk [9]. Therefore, it was necessary to study the cognitive characteristics of nurses to reduce the risk of cognitive failures and increase patients' safety. For this purpose, this study was performed in Al-Zahra Hospital in Isfahan.

MATERIALS AND METHOD

Al-Zahra Hospital is one of the most important medical centres in Iran with 950 approved beds, 800 active beds, 48 wards, specialized and sub-specialized units and paraclinical units. To investigate the cognitive failures of the nurses of this hospital in terms of demographic variables, the present study was conducted. The Cognitive Failures Questionnaire was used to assess human cognitive error [1, 19]. The number of 30 questions with a Likert scale of five degrees was used in this questionnaire with its reliability and validity of Broadbent et al., [20]; 85% and by Allahyari et al., [21]; 0.96, respectively. The dimensions of this questionnaire were memory error, concentration error, accuracy error and motor-cognitive functions error. To get the overall score of the questionnaire, the sum of the scores of all the questions were added together. This score was ranged from 35 to 175. Higher scores indicate higher cognitive failures in the workplace and vice versa. In the study of Allahyari et al., [21], the content validity of the questionnaire was 7%, which indicated the appropriate validity of this tool. Also, the reliability of the questionnaire or its reliability was calculated using Cronbach's alpha measurement method. Usually, the range of Cronbach's alpha reliability coefficient was from zero (0) meaning instability to a positive one (+1) means complete reliability, and the closer the value obtained to a positive one (+1), the more reliable the questionnaire is. Cronbach's alpha for the occupational cognitive failures questionnaire was 96%, which indicates the excellent reliability of this tool [19]. Cognitive failures are the inability of a person to complete and perform a task that he or she is normally able to perform. A few common examples of these cognitive failures are throwing away what we were trying to hold in our hands or pouring flour into coffee while we were trying to add sugar. Broadbent et al., [1] designed general cognitive failures to measure the daily normal cognitive errors that individuals commit. The tendency to examine these errors arose after Rison's work on the classification of human error. This questionnaire has 25 questions with a 5-point Likert scale. The validity and reliability of this questionnaire were good and its Cronbach's alpha was reported to be 0.92. This questionnaire was derived from three important components of cognitive processes including memory slippage, attention slippage, and psychomotor slippage [1]. The Cognitive Failures Questionnaire were widely used in various researches

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and its relationship has been investigated with various variables such as human error, stress, personality, etc. In ergonomics, there was a tendency to measure the cognitive and mental capacities of individuals using this tool. The outputs of the cognitive failure questionnaire were related to structures such as accidents and outputs such as human error and psychological pressures. In a healthy working population, this tool can measure the cognitive resources of individuals including attention, memory and action [22]. Much research has been done on general cognitive failures as a personality-related trait. Unfortunately, despite the proven relation of cognitive failure with the concept of people being vulnerable and the occurrence of accidents, how these failures occur in the workplace has been less studied. Especially considering that the CFQ questionnaire does not specifically assess occupational cognitive failures [23]. In this regard, Wallace [5], after several studies on cognitive failures, designed a questionnaire to assess occupational cognitive failures. The Workplace Cognitive Failure Scale (WCFS) questionnaire was designed to assess occupational cognitive failures more specifically. This tool has been designed after 2 stages of study in several different communities based on a structure similar to CFQ in the form of 15 questions.

Wallace et al., [5] suggested the three subscales of memory, attention, practice, and overall cognitive failure scores to get the results of this tool. WCFS is a credible and acceptable tool in assessing occupational cognitive failures. The Wallace et al., [5] showed a stronger association of this questionnaire with outputs such as unsafe behaviour, occupational accidents, and other occupational variables [5]. This questionnaire has also been used in several studies among nurses to assess cognitive failures. The validity of this questionnaire confirmed [9, 24-27]. This questionnaire has no questions with a negative score. The results were obtained in the form of 3 subscales and an overall score after averaging the questions. The high score in this questionnaire indicated more cognitive failure. Table 1 shows the dimensions of the Cognitive Failure Questionnaire.

Table 1. Dimensions of the Cognitive Failures Questionnaire

Dimensions	Questions
Memory	1, 2, 3, 4, 5
Attention	6, 7, 8, 9, 10
Action	11, 12, 13, 14, 15
Overall score	Sum of all questions

The Demographic Characteristics Questionnaire was also assigned to questions such as age, gender, weight, height, work experience, level of education, marital status, employment in the shift system, and so on.

RESULTS

The objective status of variables was determined based on the frequency tables and graphs. Next to that, indicators of the tendency were also used to determine centre such as mean and median via scattering indicators such as standard deviation, variance, minimum and maximum.

Table 2. Frequency table in terms of demographic variables

Categories		Frequency	Percentage
Age	Less than 25 years	16	6.58
	25-35 years	110	45.27
	35-45 years	92	37.86
	More than 45 years	25	10.29
Gender	Woman	162	66.5
	Man	79	32.5
Education	BSc	208	85.6
	MSc	35	14.4
Workplace section	Surgery	47	19.3
	Paraclinical	33	13.6
	Emergency	60	24.7
	Intensive care	51	21
	coronavirus	46	18.9
	Nursing Station	6	2.5
Marital status	Single	78	32.1
	Married	165	67.9
Working hours per week	44 hours and less	18	7.4
	More than 44 hours	225	92.6
Employment status	Official	90	37.03
	Contractual	122	50.21
	Plan-based	31	12.76
Work experience	Less than 10 years	121	49.8
	10-20 years	88	36.2
	More than 20 years	33	13.6

Table 3. Descriptive indicators of research quantitative variables

Index	Average	Standard Deviation	Variance	Minimum	Maximum
Age	35.85	7.15	51.19	23	51
Working hours per week	52.25	11.38	129.66	30	200
Work experience	11.61	7.08	50.22	0	28
Cognitive Failure	63.46	7.92	62.82	40	104

Demographic data of this study indicated that 6.58% of the people in the study were under 25 years old, 45.27% of them were 25-35 years old, 37.86% of them were 35-45 years old and 10.29% of them were more than 45 years old. 66.5% were women and 32.5% were men. 85.6% had a bachelor's degree and 14.4% had a master's degree.

32.1% were single and 67.9% were married. 37.03% were formally employed, 50.21% were contract-employed and 12.76% were project-based. 49.8% of the people in the study had less than 10 years of work experience, 36.2% of them had 10 to 20 years of work experience, 13.6% had more than 20 years of experience. 7.4% of the people in the study work 44 hours or less and 92.6% of the people in the study work more than 44 hours per week. 19.3% of the people in the study work in the surgical ward, 13.6% of the people in the study work in the paraclinical ward, 24.7% of the people in the study work in the emergency ward, 21% of the people in the study work in the intensive care ward, 18.9% of the people in the study work in the coronavirus ward and 2.5% of the people in the study work in the nursing office. According to the results of the current study, 12.76% were working elsewhere, 1.65% were undergoing psychiatric treatment, 53.09% had experienced mental illness in the past 6 months, and 14.81% had a chronic illness.

Centrifugal index (mean) and scatter index (standard deviation, variance, minimum, maximum) of cognitive failures were calculated as 63.46, 7.92, 62.82, 40, and 104, respectively. The minimum and maximum indices, as well as the standard deviation, indicated the absence of outdated data and the proximity of the scatter of variables. The cognitive failure index can change in the range of 35 to 175. According to the research results, the mean of cognitive failure based on concurrent work elsewhere had a mean of 63.35 and a standard deviation of 9.16, the mean of cognitive failure based on psychiatric treatment had a mean of 64.25 and a standard deviation of 6.34, the mean of cognitive failure based on mental illness experience in the last 6 months had a mean of 63.5 and a standard deviation of 6.9 and the mean of cognitive failure based on chronic disease had a mean of 62.27 and a standard deviation of 4.05.

Based on the results of the Kruskal-Wallis test, there was no statistically significant difference (χ^2=4.77, p=0.18) between cognitive failure in people under 25 years, 25-35 years, 35-45 years, and more than 45 years. There was no significant difference (χ^2 =3.47, p=0.62) between cognitive failures in a surgical, emergency, intensive care, corona, nursing and paraclinical wards. Also, there was no significant difference (χ^2=0.16, p=0.92) between cognitive failures in individuals who were employed formally, contract-based and project-based. There was no significant difference (χ^2=0.63, p=0.72) between cognitive failure in people with less than 10 years, 10-20 years and more than 20 years of work experience. Based on the results of the U Mann-Whitney test, there was no statistically significant difference (Z=-0.77, Sig.=0.43) between cognitive failures in male and female nurses. There was no statistically significant difference between cognitive failures in nurses working only in the study area and nurses working in other places at the same time (Z=-0.59, Sig.=0.55). Also, there was no statistically significant difference (Z=-0.38, Sig.=0.702) between cognitive failure in nurses with bachelor's and master's degrees. There was no statistically significant difference between cognitive failures in nurses who work 44 hours a week or less or more than 44 hours (Z = -0.65, Sig. = 0.51). There was no statistically significant difference (Z= -0.20, Sig.=0.83) between cognitive failures in nurses undergoing psychiatric treatment and those not in such conditions. Also, there was no statistically significant difference between cognitive failure in nurses who had experienced mental illness in the last 6 months and those who had not such experience (Z=-0.53, Sig.=0.59). There was no statistically significant difference between cognitive failures in nurses with chronic disease and nurses without the chronic disease (Z= -0.93, Sig.=0.35).

DISCUSSION

The results of the present study on the mean cognitive failure index in terms of demographic variables in this study showed that in terms of mean cognitive failure was not observed a significant difference between different groups. In other words, there was no significant difference in terms of cognitive failure in terms of demographic factors. Based on the results of

Table 4. Mean cognitive failure based on demographic indicators

Variables		Significance level	Test statistics	Standard deviation	Average	Number
Age	Less than 25 years (number)	0.18	χ^2=4.77	8.54	61.37	16
	25-35 years (number)			6.95	63.3	110
	35-45 years (number)			9.97	64.63	92
	More than 45 years (number)			3.9	61.28	25
Gender	Woman (number)	0.43	z=-0.77	8.64	63.75	162
	Man (number)			6.3	63	79
Education	Bachelor (number)	0.702	z=-0.38	8.26	63.53	208
	Master (number)			5.55	63.05	35
Workplace section	Surgery (number)	0.62	χ^2=3.47	6.67	63.38	47
	Emergency (number)			8.38	64.25	60
	Intensive care (number)			6.63	61.41	51
	Corona (number)			7.99	63.23	46
	Nursing Office (number)			7.52	67.33	6
	Paraclinical (number)			10.04	64.96	33
Marital status	Single (number)	0.67	z=-0.41	5.78	63.1	78
	Married (number)			8.77	63.64	165
Working hours per week	44 hours and less (number)	0.51	Z=-0.65	12.5	62.44	18
	More than 44 hours (number)			7.47	63.55	225
Employment status	Official (number)	0.92	χ^2=0.16	6.63	62.97	90
	Contractual (number)			8.46	63.76	122
	Project-based (number)			9.29	63.74	31
work experience	Less than 10 years (number)	0.72	χ^2=0.63	80.84	63.14	121
	10-20 years (number)			81.43	63.88	88
	More than 20 years (number)			86.26	63.27	33

Kruskal-Wallis test, there was no statistically significant difference (χ^2 =4.77, p = 0.18) between cognitive failure in people under 25 years, 25-35 years, 35-45 years, and more than 45 years. According to Rast et al., [28] and Heckhausen et al., [29], the number of cognitive failures reported by individuals, increases in high ages. Public perceptions showed that older people were more forgetful, careless, and clumsy than younger people. This result contradicted the result of the present study. Bolla et al., [30], Derouesné et al., [31] and Hertzog et al., [32] also stated that if adults were asked to assess their cognitive or memory function, they usually cited a negative relationship between age and their cognitive or memory function.

et al., [33], Ponds, van Boxtel [34] and Zimprich et al., [35] stated that individual differences in subjective assessments of cognitive function or memory had a poor relation to individual differences in cognitive and memory function which measured by psychological tests, and it implied that subjective judgments about cognitive function were based in part on objective function. It was further found that there was no significant difference (χ^2 =3.47, p=0.62) between cognitive failures in surgical, emergency, intensive care, corona, nursing and paraclinical wards. Also, there was no significant difference (χ^2 =0.16, p=0.92) between cognitive failures in individuals who were employed formally, contract-based and project-based. Based on the results of cognitive failure, there was no statistically significant difference (Z=-77., Sig.=0.43) between male and female nurses. The findings of Hussain et al., [36] and Arthur Jr et al., [37] showed no gender differences in occupational cognitive failure. The slight difference was due to the similar nature of the occupation of male and female physicians. The findings of the current study were consistent with the present study. Nurses and doctors were both hospital staff and gender did not play a significant role. In case of distraction or inattention, the risk of endangering the safety and health of patients increased. Also, there was no statistically significant difference (Z=-0.59, Sig.=0.55) between cognitive failures in nurses who work only in the study area and nurses who work in other places at the same time. The results of Jarahian et al., [38] and Rezaei et al., [39] showed that male nurses had a higher chance of error than female nurses. They argued that men were the breadwinners of the family and usually had a second job as a way to increase their income. Therefore, this result may be due to the high level of mental and occupational concerns of male nurses, which affected the incidence of safety accidents. This finding was in contradiction with the findings of the present study, but in the study of Saki et al., [40], it was stated that gender was not associated with nursing errors, which was consistent with the findings of the present study. Accordingly, there was no significant difference between men and women in the incidence of nursing errors. Also, the relationship between the second job and gender was not specified. Also, there was no statistically significant difference (Z=-0.38, Sig.=0.702) between cognitive failure in nurses with bachelor's and master's degrees. There was no statistically significant difference between cognitive failures in nurses who work 44 hours a week or less or more than 44 hours (Z=-0.65, Sig.= 0.51). According to the findings of Anoosheh et al., [41], unusual working hours play an important role in the occurrence of nursing errors. This finding contradicts the results of the present study. Atefi et al., [42] also stated that the standard working week of nurses in public hospitals in Iran was 44 hours. Nurses cannot work more than 12 hours a day, and working hours can be reduced to 36 hours per week for some specialties and young nurses. Also, according to the study of Elfering et al., [27], time pressure may increase cognitive failures during work. There was no statistically significant difference (Z=-0.20, Sig.=0.83) between cognitive failures in nurses undergoing psychiatric treatment and those not in such conditions. Also, there was no statistically significant difference between cognitive failure in nurses who had experienced mental illness in the last 6 months and those who had not had such experience (Z=-0.53, Sig.= 0.59). This finding contradicts the finding of Matthews et al., [43]. According to the results of the present study, conscientiousness had a negative relationship with cognitive failure and being nervous had a positive relationship with cognitive failure. The mechanism behind the association between personality traits and cognitive failures reflects differences in coping with stressors that were also related to nervousness and conscientiousness. It seemed that people with less sensivity to cognitive failures, nervousness, and a higher conscience were able to cope with problems better than people who are more vulnerable to such failures. There was no statistically significant difference between cognitive failures in nurses with chronic disease and nurses without chronic disease (Z=-0.93, Sig.=0.35). Mahdinia et al., [44] concluded that chronic illness and work experience increase the risk of cognitive failure. The most effective variable was chronic diseases and the least effect was related to work experience. According to the results of Mahdinia et al., [44], the risk of cognitive failures in people with the disease was higher than others. In addition, their results showed that with increasing work experience, the risk of cognitive failures also increased, which contradicts the results of the present study. Based on the present study, there was no significant difference (χ^2 = 0.63, p = 0.72) between cognitive failure in people under 10 years, 10-20 years, and more than 20 years of work experience. According to the present results, it seemed that different work experiences do not play a significant role in the occurrence of disorders in thinking, concentration, and attention of nurses.

CONCLUSION

Based on the study, it was found that there was no significant relationship between the parameters of age, gender, level of education, chronic disease, mental problems, work experience, working hours, activity in different wards of the hospital, type of employment, marriage, and second job with cognitive failures of nurses. Cognitive failures in Al-Zahra Hospital in

Isfahan were due to non-demographic parameters. Therefore, it was necessary to study the effective factors in the incidence of cognitive failures of nurses in this hospital.

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CONFLICT OF INTEREST

The authors declare no conflicts of interest.

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