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The Open Nursing Journal

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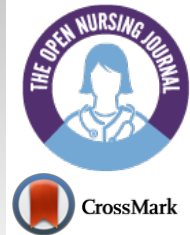
RESEARCH ARTICLE

Evidence-Based Practice and its Relationship to Quality Improvement: A Cross-Sectional Study among Egyptian Nurses

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Abstract:

Background:

Implementing Evidence-Based Practice (EBP) and Quality Improvement (QI) were recognized as the core competencies that should be held by all healthcare professionals, especially nurses, as front-line healthcare providers. Assessment of the current level of knowledge, skills, and attitude of nurses, regarding EBP and QI, is important for the design of strategies that could enhance the competence of nurses in such practices and, in turn, promote patient care quality.

Objective:

This study aimed to assess the attitudes, knowledge, and skills of nurses in Evidence-Based Practice (EBP) and Quality Improvement (QI), in addition, to studying the relationship between EBP and QI.

Methods:

A cross-sectional study was conducted using a convenient sample of nurses (N=300) who work in three Egyptian hospitals in Alexandria city, representing the university, governmental, and private health sectors. The EBP and QI questionnaires were used in addition to a demographic form for the studied nurses. Statistical analysis was carried out using ANOVAs, student t-test, Pearson correlation, and Regression analysis (R^2).

Results:

Nurses displayed positive attitudes toward both EBP and QI. However, they perceived themselves to be lacking sufficient EBP knowledge and need to improve their QI skills. There was a strong positive correlation between EBP and QI with a predictive power of QI on EBP (r= 0.485, R^2 = 0.273, *p*<0.001).

Conclusion:

Nurses need educational support for enhancing their attitude, knowledge, and skills related to EBP and QI. To prepare for educational programs, hospitals and nursing administrators should consider the characteristics of nurses, work schedules, and obstacles in the use of EBP. Hospital managers should also implement effective strategies to resolve the barriers and boost facilitators to increase the use of EBP among Egyptian nurses and promote QI.

Keywords: EBP, Cross-sectional study, Hospitals, Nurses, Quality improvement, ANOVA.

1. INTRODUCTION

A noteworthy focus has been placed on enhancing the quality of healthcare services, patient safety outcomes, and cost control in the healthcare system framework [1, 2]. Therefore, a more prominent emphasis was placed on Evidence-Based Practice (EBP), which was recognized as crucial for promoting healthcare excellence [3,4]. EBP is defined as a systematic method of evaluating the best available scientific evidence from studies and clinical experience, including patient interests, beliefs, expectations, and needs to make a clinical

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decision that will affect patient care in particular circumstances [5, 6]. EBP has become a suitable framework and the predominant care model that has been recognized for facilitating the transfer of research evidence to clinical practice [7]. Likewise, as a key requirement within health care organizations, there is a growing body of inquiries regarding implementing Quality Improvement (QI) initiatives. Yet, the determinants of QI success in hospitals are poorly understood. Hospital possession and preservation of the adequate knowledge and skills required for QI will boost the quality of health care services [8].

1.1. EBP and QI

Implementing EBP and QI are recognized as crucial competencies that should be held by all healthcare professionals. Clinical research, EBP, and QI are separate but interrelated areas of investigation [9, 10]. QI is described as systematic, information-driven change-focused activities designed to improve healthcare [3]. Although EBP was considered the gold standard and a problem-solving approach to deliver safe and high-quality patient care [5], QI was found to be a vital contextual organizational factor for the adoption of EBP and can be used to validate the introduction of EBPs [3] while clinical research offers empirical evidence for EBP [10]. To significantly influence the improvement of quality in healthcare, there is a need to apply evidence-based practice (EBP). Without EBP, healthcare providers are at risk for variances in care that could seriously affect patient outcomes [11]. The inconsistent incorporation of research evidence into clinical practice persists, amid guidance and market pressure, and the gap between research evidence and EBP is frequently reported [12]. Also, few empirical studies have investigated EBP in relation to QI [4].

1.2. Context and Significance of the Study

Egyptian Hospital Accreditation Program complements that quality is improved when the hospital ensures that care follows "best practices" that are based on professional and evidence-based literature, not on individual opinion or routine. Consequently, the demand for quality improvement in hospitals is growing [13]. Nurses play a critical role in improving healthcare quality and their work has a significant effect on the patients' care and health since they are actively involved in almost all aspects of hospital quality. Based on this assumption, nurses are at the heart of the system and considered the best people to work towards improving the processes by which quality care is delivered in the healthcare setting [14].

The World Health Organization, in particular, has suggested that nursing in Egypt is one of the skilled professions that has faced many challenges in past years. The key nursing problems are focused on education, performance, and little institutional recognition or support in the workplace. Healthcare organizations are now challenged to improve nurses' skills and knowledge of emerging professional health expertise through ongoing training and development [15]. Nurses have traditionally relied on the professional opinions of experienced nurses in clinical decision-making [16]. But these conventional methods are not only outdated but also unsafe.

Also, experienced-based knowledge can also be linked to biased thinking, which leads to errors. Nowadays, as they are interested in clinical decision-making, nurses are forced to integrate scientific findings and make appropriate and justifiable decisions in their practice [1, 2].

Implementation of evidence-based practice (EBP) in health care organizations is recognized as a clinical practice challenge. It requires a comprehensive collection of skills to formulate questions that occur during the work and the ability to perform analysis on it, objectively analyze information, and implement outcomes in the patient care process [11, 17]. Despite the availability of innovative research-based knowledge and published papers with the potential to increase the quality of nursing care and progress on EBP, nursing practice is still not evidence-based [4, 16].

Other studies showed that nurses rarely integrate research findings into their practice and may not be well trained for EBP. They lack adequate knowledge of evidence-based concepts and use them to a limited level [18 - 20]. Many nurses reported that they do not know how to find the appropriate research reports and have difficulty in identifying clinical practice implications of the research findings [18]. Thus, they tend to use knowledge from experience and social interactions and only a small percentage of nurses consistently use EBP [18 - 20]. Moreover, despite the benefits of EBP, there are numerous barriers hampering the adoption and use of EBP and research continues to find inconsistencies in its implementation in the clinical work environment [1, 16]. Hence, it seems imperative to overcome the obstacles and promote facilitators in order to adopt the best evidence and improve care delivery and patient outcomes [9].

1.3. Problem Statement

Notably, the majority of studies examine nurses' and other healthcare professionals' views on EBP and barriers encountered, yet when it comes to its relation to quality improvement among Egyptian nurses, the evidence is somewhat limited. In the Egyptian context, the culture in healthcare agencies and schools of nursing did not encourage the utilization of EBP and EBP literacy. Considering the novelty of EBP's ideas in nursing education, most Egyptian nursing research focused on the understanding of nursing educators' evidence-based practice [21 - 24] with delimited research targeting nurses in clinical settings [23]. It is believed that the health care system does not have empowered nurses to engage in research and EBP [23, 24]. This could impede the translation of the research activities into a unified EBP framework. Even with the growing focus on EBP, little is known about current EBP's knowledge, skills, and attitude and its relationship to QI among nurses in Egyptian hospitals, and the barriers that could be faced in EBP applications. To the best of the researchers' knowledge, there is a paucity of research in the clinical sector, and there is no previous study targeting EBP and its relationship to QI in different health sectors.

Hence, it is important and timely to explore the factors that can help nurses and policymakers gain more insight into the obstacles to adopt and implement EBP in nursing and how this can apply to QI. Therefore, the present research was targeted to contribute to this research gap.

1.4. Aim of the Study

The main objectives of this research were to: assess nurses' perception of knowledge, skills, and attitude in EBP and QI, and investigate the relationship between EBP and QI.

Further objectives were to identify the barriers and facilitators nurses perceived for EBP and to identify the individual and work-related characteristics that might be associated with the perception of EBP and QI.

2. MATERIALS AND METHODS

2.1. Research Design and Setting

A cross-sectional descriptive research design was conducted in inpatient care units at three Egyptian hospitals associated with various health sectors in Alexandria City: namely Hospital 1, which is a non-profit teaching hospital associated with Alexandria University with a capacity of 300 beds; Hospital 2 is a government hospital affiliated with the Ministry of Health, with a total of 130 beds; Hospital 3 is a for-profit private health sector-related, with a capacity of 100 beds. These hospitals play a major role in providing extensive and multi-specialty healthcare services in many regions/ governorates in Egypt, including medical, surgical, emergency, and multi-specialty care.

2.2. Participants and Sampling

A convenience sample of staff nurses, working at the aforementioned hospitals, was invited to take part in the study (N=300). Convenience sampling (also known as availability sampling) is a particular form of non-probability sampling technique that relies on data collection from a population willing to participate in the study. Inclusion criteria included all nurses who have at least six months of experience in their hospitals and willingness to participate, while nurses less than six months of experience and interns were excluded. The sample size was calculated using the "Epi info program version 7" based on a 5% variance, 95% confidence level, and 0.80 power, and the minimum sample size was 100 nurses from each hospital.

2.3. Study Measurements Tools

2.3.1. EBP Questionnaire (EBPQ)

The EBPQ was developed by Upton and Upton [17] and adapted to assess the perceptions of EBP among nurses. The EBPQ comprises 24 items covering three subscales: knowledge (14 items), use/skills (six items), and attitudes (four items). The responses were calculated on a seven-point Likert scale, ranging from 1 (strongly disagree) to 7 (strongly agreed). A higher score shows a higher level of knowledge, use, and a positive attitude towards EBP. Besides, the researchers have introduced two open-ended questions to ask nurses about perceived barriers and facilitators to implement EBP from their point of view.

2.3.2. Quality Improvement Questionnaire (QIQ)

Hwang and Park [4] developed the QIQ questionnaire to assess the perception of QI by nurses. QIQ includes 17 items

reflecting three subscales: knowledge (three items), skills (nine items), and attitude (five items). Responses were graded on a Likert scale of 5 points, where 1 corresponds to minimum or strongly disagree and 5 corresponds to excellent or strongly agree. A higher score shows a higher level of QI subscales. Permission to use the study instruments was received. In addition, the researcher developed a form of demographic and work-related characteristic for studied nurses.

2.4. Validity and Reliability

The study tools were translated into Arabic to suit the culture of the participants and tested for content validity along with the fluidity of the translation in the field of study by a jury of academic members. A minor modification was made in rewording few statements according to the received feedback. The study instruments were tested for internal reliability using Cronbach's alpha correlation coefficient. The findings proved both EBPQ and QIQ as reliable tools, with correlation coefficient α of 0.94 and 0.91, respectively. Moreover, a pilot study was achieved with 30 nurses (10%) on 10 nurses from each hospital who were excluded from the study subjects.

2.5. Data Collection

To collect the required data, official approval was obtained from the administrators in the specified hospitals. Upon receiving their approval, the questionnaires were hand-delivered in a paper format by the first author with specific guidance to nurses. According to their work shifts and break time described by each unit nurse manager, the author approached nurses. A final of 300 completed questionnaires were collected over three months (May-July 2018).

2.6. Ethical Considerations

Approval was received from the Faculty of Nursing, University of Alexandria. The researchers clarified to all participants the purpose of the study. Data privacy and confidentiality were maintained and ensured by obtaining informed consent. Participants were granted anonymity and the right to withdraw from the study at any time.

2.7. Data Analysis

Data were analyzed using IBM SPSS version 22. The internal consistencies of the EBPQ and QI scales were determined with Cronbach's alpha coefficients. The normality of the data was obtained through descriptive statistics of means, standard deviations, and frequencies. Data on the general features of nurses, EBP, and QI levels are summarized using frequencies, percentages, mean, and standard deviations (SDs). For each EBP and QI subscale, the mean scores were added. Content analysis was used for the two open-ended questions regarding perceived barriers and facilitators to the implementation of EBP. In order to identify the single largest barriers and facilitators, the frequencies and percentages of respondents who reported each barrier and facilitator were calculated, and items were ranked in order accordingly.

Analyses of variance (ANOVA) was used to analyze variations in EBPQ and QI scores among hospitals and in relation to participants' individual and work-related charac-

teristics and Pearson's correlation test was used to assess the relationship between the EBP and QI. The Regression Analysis (R^2) has been used to test the independent variable (QI) predictive power on the dependent variable (EBP). R^2 change was tested with the F-test. A significant F value for R^2 meant that the QI added a significant prediction of EBP. Based on the univariate analysis, stepwise multiple regression analyses were performed to determine factors associated with EBP and QI levels, respectively. Nurses' age, years of nursing experience, and educational level were significantly correlated with the scores for both EBPQ and QI scales; hence, we utilized the overall scale scores in the analysis. The statistical significance point has been set at $p \leq 0.05$.

3. RESULTS

3.1. Nurses' Demographic and Work-related Characteristics

The general characteristics of the respondents are shown in Table **1**. The majority (75.7%) of the nurses surveyed were female, and 42.3% were between the age of 30 and under 40 years old. Nurses were distributed between 23.0% and 26.7% across different units of work. Approximately one-quarter of nurses (26.7%) worked in ICUs and the same proportion worked in miscellaneous (multi-specialty) units. The highest percentage of nurses (43.3%) held a bachelor's nursing degree,

while 39.0% had a high school diploma. In addition, 38.3% of nurses had less than five years of experience, while 10.7% had more than 20 years of nursing experience. Approximately two-thirds (65.3%) of nurses were verified to have previous EBP information, 81.63% of them referred to the previous study as the main source of this information.

3.2. Nurses Perception of EBP and QI at Studied Hospitals

With regard to the perception of research variables, Table **2** indicates that the mean score and standard deviation of the perception of overall EBP by nurses are moderate (3.57±0.70) with the highest mean for attitudes towards EBP (4.80±1.18), followed by the use of EBP (3.57±1.20) and EBP knowledge (3.22±0.68). Additionally, Table **2** reveals no significant difference among nurses' groups at the three studied hospitals regarding their perception of overall EBP (F =0.832, p= 0.436). Only a significant difference was found among nurses' groups regarding their attitudes toward EBP (F=3.469, p= 0.032). Nurses at hospital 3 (profit hospital) reported higher attitudes towards EBP than nurses in hospitals 1 and 2 (university and governmental hospitals). On the other hand, significant differences were found among nurses' groups regarding their perception of overall QI (F =4.638, p= 0.010) and related subscales (p<0.05). Nurses at hospital 3 reported higher QI knowledge (F =3.200, p=0.042), attitudes towards QI (F =5.206, p=0.006), and QI skills (F =0.5.464, p= 0.005) than nurses in hospitals 1 and 2.

Table 1. Distribution of nurses' groups according to demographic characteristics (N = 300).

Demographic characteristics	Total (N= 300)	
	No.	**%**
Gender		
Male	73	24.3
Female	227	75.7
Age (years)		
<20	58	19.3
20 - <30	127	42.3
30 - <40	73	24.3
40 - <50	34	11.3
≥50	8	2.6
Unit		
Medical	69	23.0
Surgical	71	23.6
ICU	80	26.7
Miscellaneous (Multi-specialty)	80	26.7
Education		
Bachelor's degree of Nursing	130	43.3
Diploma of Technical Institute	53	17.7
Diploma of Secondary Nursing School	117	39.0
Years of experience		
<5	115	38.3
5 – <10	71	23.7
10 - <15	48	16.0
15 - <20	34	11.3
≥20	32	10.7
Previous Information with EBP		

(Table 1) contd.....

Demographic characteristics	Total (N= 300)	
	No.	%
Yes	196	65.3
No	104	34.7
Source of this Information (n=196)		
Previous study	160	81.63
workshop/ Training program	36	18.37

Table 2. Nurses' perception of EBP and QI at the studied hospitals.

Variables of the study	Overall Mean ± SD.	Hospital 1 Mean ± SD.	Hospital 2 Mean ± SD.	Hospital 3 Mean ± SD.	F	*P*
EBP						
Overall EBP¥	3.57±0.70	3.58±0.85	3.62±0.63	3.50±0.59	0.832	0.436
Knowledge of EBP	3.22±0.68	3.23±0.76	3.29±0.59	3.12±0.67	1.673	0.189
Use (skills) of EBP	3.57±1.20	3.76±1.37	3.52±1.26	3.42±0.91	2.171	0.116
Attitudes Toward EBP	4.80±1.18	4.55±1.20	4.92±1.36	4.98±0.91	3.469	0.032*
QI						
Overall QI†	3.90±0.58	3.78±0.73	3.88±0.49	4.03±0.47	4.638	0.010*
QI knowledge	4.36±0.66	4.42±0.63	4.23±0.71	4.43±0.61	3.200	0.042*
Skills of QI	3.49±0.76	3.29±0.93	3.57±0.59	3.61±0.69	5.464	0.005*
Attitudes towards QI	4.35±0.71	4.29±0.78	4.23±0.67	4.53±0.62	5.206	0.006*

SD: Standard Deviation F: F value for ANOVA test *: Statistically significant at $p \leq 0.05$.
¥EBP on Seven-point Likert scale †QI on Five-point Likert scale

3.3. Barriers and Facilitators to the implementation of EBP

In response to the two open-ended questions asking about perceived barriers and facilitators to the implementation of EBP, the number of nurses responded to these questions was 201(67.0%). Some nurses identified more than one barrier or facilitator. The most widely identified obstacles to EBP were: lack of time for reading and searching (100.0%), lack of adequate staff knowledge and skills of EBP (93.75%), inadequate training of nurses on EBP, especially diploma degrees (64.38%), and inadequate resources and facilities (56.25%). On the contrary, the most important facilitators that could help nurses use EBP were periodic training programs on EBP and updated nursing research (100.0%), supportive hospital management (79.60%), and the presence of facilities and role models for applying knowledge and skills of EBP (44.78%). See Supplementary Table **1**.

Table 3. Multivariate regression analysis between EBP and QI.

Variables	B	SE	t	p	95% CI LL- UL
QI knowledge	0.164	0.051	3.206	0.001*	0.95-0.396
Attitudes towards QI	0.062	0.049	1.261	0.208	-0.239-0.052
Skills of QI	0.289	0.032	8.797	<0.001*	0.333-0.524
r= 0.485, R² = 0.273, F = 36.973, *p<0.001*					

B: the coefficient estimates SE: standard error t: t-test value F: F-test
r: Pearson correlation coefficient R²: regression coefficient
CI: Confidence interval LL: Lower limit, UL: Upper Limit *Statistically significant at $p \leq 0.5$

Table 4. Stepwise regression results for factors associated with overall EBP and QI scores.

Variables	B	SE	t	*p*	95% CI LL-UL	B	SE	t	*p*	95% CI LL-UL
Evidence-based practice						**Quality improvement**				
Age	-4.457	1.189	3.748	0.001*	-0.408-0.127	-2.994	1.493	2.006	0.046*	-0.237-0.002
Years of experience	3.564	0.902	3.951	0.001*	0.107-0.320	1.829	1.132	1.615	0.107	-0.016-0.162
Education level	2.065	0.772	2.676	0.005*	-0.215-0.033	3.697	0.969	3.817	0.001*	-0.224-0.072

B: the coefficient estimates SE: Standard Error t: Student t-test *: Statistically significant at $p \leq 0.05$
CI: Confidence interval LL: Lower limit, UL: Upper Limit

3.4. Correlation and Multivariate Regression Analysis between EBP and QI

Table **3** indicates a strong positive, moderate correlation between the EBP and QI, as perceived by nurses (r= 0.485, $p<0.001$). The coefficient of regression between QI and its related dimensions, as independent variables, and EBP, as a dependent variable, was $R^2=0.273$. This means that approximately 27.3% of the explained variance of EBP is accounted for QI and associated subscales, particularly, QI knowledge and skills that contribute important prediction of EBP where the regression model is significant (F= 36.973, $p<0.001$). For further correlation values, see Supplementary Table **2**.

3.5. Factors Associated with Nurses' Perceptions of EBP and QI

Table **4** showed the stepwise regression analysis, which revealed that the overall EBP score was significantly associated with nurses' age, years of experience, and educational level. Younger nurses had the lowest perceived EBP score (β=-4.457,$p<0.001$), whereas nurses with more years of experience and a bachelor's education degree had higher EBP scores (β=3.564, $p<0.001$; β=2.065, $p=0.005$), respectively. As for QI, the result showed that age and educational level were statistically important factors correlated with the QI ratings. Specifically, younger nurses (β=-2,994, $p=0.046$) had a lower perceived QI rating, while bachelor's nurses had a higher QI rating (β=3,697, $p<0.001$).

4. DISCUSSION

The present study revealed that nurses have a moderate perception of the overall attitude and use of EBP while they have a low knowledge level of EBP. Nurses were optimistic towards EBP but felt that they lacked the adequate knowledge to fully understand the language of EBP and to carry out its activities, particularly those who did not work on nursing research and finding evidence. This finding goes in the same line with many previous studies. For example, Egyptian studies conducted by Mohsen *et al.* [25] found that nurses had a positive attitude towards EBP, yet they lacked the knowledge and basic skills of EBP for practical application. Nevertheless, Mohamed and Mohamed [26] reportedly found that nurses had unfavorable attitudes towards EBP and preferred using traditional methods over changing to new approaches in care. They perceived themselves to have a reasonable level of skills to pursue various EBP activities. Other studies conducted by Karki *et al.* [27], Ammouri *et al.* [28], and Foo *et al.* [29] showed that nurses' perceptions of EBP knowledge and skills were variable and they lacked the competence and knowledge to conduct it, but they had a positive and supportive attitude towards EBP.

The current findings revealed that some barriers reported by nurses might negatively affect their knowledge, attitude, and skills and impede their smooth adoption of EBP. The most commonly identified obstacles to EBP were lack of time, lack of sufficient personnel expertise and EBP preparation, and insufficient services and facilities. The current study confirmed what has been shown in previous studies regarding common barriers to the adoption of evidence-based practice among Egyptian nurses, such as lack of evidence-based information, difficulty in evaluating the validity of research articles and reports, lack of resources and time to read research articles and change their current practice, insufficient resources to implement EBP, and limited Information Technology (IT) skills [22, 25, 26]. Many nurses have not received any formal training on the application of EBP [25, 26]. This is in line with previous studies that documented similar results in addition to insufficient organizational support and lack of research awareness/use [19, 28].

On the contrary, nurses emphasized many facilitators that could help them incorporate EBP as periodic training programs on EBP and updated nursing studies, supportive hospital management, provision of facilities, and role models for applying EBP skills. This result is consistent with what is stated in Egyptian studies that described the key facilitators for using evidence-based practice as adequate preparation, access to literature, giving sufficient time and enhancing the culture of EBP adoption, improving administrative support, and cooperative and supportive colleagues [21, 22, 26]. Hence, more focus should be given to improving nurses' knowledge and skills for evidence-based care. It is important to point out that the Egyptian Information Bank [30] was launched in 2016 as one of the largest national projects in Egypt, with the goal of promoting complete and free access to vast and diverse sources of knowledge for all Egyptians, which could also be beneficial in nurses' training.

The results revealed positive attitudes towards QI, high knowledge of QI, and moderate QI skills among nurses. Hwang and Park [4] also found that nurses regarded their level of QI knowledge and skills as above average, and their attitude to QI was positive. This finding may be due to the introduction of QI programs in the hospitals through the quality assurance units being a prerequisite for the accreditation of all hospitals, which has prompted efforts to strengthen the attitudes, expertise, and QI competency of nurses. However, nurses perceived a need for more skill enhancement associated with using QI methods. In this respect, Conner [10] delineated that QI activities require continuous training, enhancement of knowledge, and skills. Hospital and nurse managers, therefore, need to enable and help their nurses to use QI resources and approaches in an active manner to recognize and address problems that affect quality care delivery. Likewise, in an earlier Egyptian multi-site study conducted by Hussein and Abou Hashish [8] arbitrated that some hospital factors may influence the involvement of nurses in QI initiatives at hospitals. The perspective of nurses revealed that QI performance is most frequently based on supervisory support, peer cohesion, and the use of creative management approaches to lead QI-related activities.

The present analysis shows that both EBP and QI are substantially correlated in the overall scores as well as in all the sub-scales. The regression coefficient value also proposed that QI has a predictive power of the EBP variance described. This finding explains that nurses believe QI is relied on looking for the best evidence for nursing practice to maximize patient outcomes. In fact, the direct association between EBP and QI

was examined by minimal empirical studies for comparison. This finding is consistent with Hwang and Park (2015), who reported strong, moderate correlations between EBP and QI scores [4]. In this vein, Gillam and Siriwardena [31] and Jylhä *et al.* [32] suggested to be successful, quality improvement programs require that clinical decision-making in nursing and management of care be focused on the best evidence available. Also, Hussein and Abou Hashish [8] reported that nurses rated understanding of the processes and the use of evidence in decision making as the main factors in increasing their hospital readiness for QI activities. Thus, the creation of a work environment that provides opportunities for nurses to share knowledge and information should be a key priority for hospital management, to maintain a safe work environment [8, 16, 33].

Moreover, this study showed that nurses' perception of EBP and QI could be affected by study setting. Nurses working at the profit hospital reported higher QI knowledge, attitudes, and skills and favorable attitudes towards EBP than nurses working in the governmental and university hospitals. This could be related to the different nature of each hospital, and the variability in the work environment structure, policies, the degree of availability and adequacy of qualified nurses, supporting information, resources, and the workload of providing health care services in the three hospitals studied. It has been reported that the quality of healthcare in Egypt varies widely depending on whether people make use of facilities provided by public or private hospitals. Private hospitals have a staff with better training and resources, a supportive work environment, which means that the quality of care in private hospitals also differs widely [34, 35].

Furthermore, it has been found that nurses' perception of EBP and QI was affected by some demographic variables, including nurses' age, education level, and years of experience. Younger nurses specifically had the lowest scores of EBP and QI, while nurses who held a bachelor's degree had the highest scores of EBP and QI. Also, experienced nurses had the highest EBP score. This may be related to the fact that Baccalaureate and experienced nurses may have a higher predisposition to access more resources, power, and information that will help them become more capable of performing independent and evidence-based nursing practices compared to diploma programs that usually do not. In agreement with this result, Mohsen *et al.* [25] reported a significant relationship between the ability to undertake different EBP activities and the level of education as it could be easier for nurses with a bachelor's degree to find research compared to diploma nurses. Also, the findings of Mohammed and Mohammed [26] showed that there were highly statistically significant positive correlations between the EBP scores of the nurses and the personal characteristics of the nurses (age, educational level, and years of experience). Eberhart [36] concluded that the level of education is strongly linked to EBP beliefs and implementation, suggesting that nurses' education raises awareness of the positive impact of EBP and stimulates a desire to use EBP. Consistent with these findings, Hwang and Park [4] found that EBP scores were significantly associated with the age and educational levels of nurses, whereas QI scores were associated with age and job position. On the other hand, Majid *et al.* [16] found that the association between years of experience and EBP was weak.

CONCLUSION

Overall, the present study concluded that Egyptian nurses exhibited positive attitudes towards both EBP and QI. However, they perceived themselves to lack adequate knowledge regarding EBP and need more training and experience to work on their QI skills. The variability in the structure of the work environment and the degree of the availability and adequacy of supportive resources among hospitals could lead to a different perception of EBP and QI. EBP and QI were significantly correlated with a predictive power of QI on EBP. It has been found that certain demographics were associated with EBP and QI scores, such as nurses' age, years of experience, and educational level. Therefore, nurse managers should consider nurses' charac-teristics in designing and implementing strategies to promote EBP and QI activities. Certain barriers and facilitators reported by nurses affecting the EBP's smooth adoption should be considered. In summary, Evidence-based practice can provide an exceptional opportunity to optimize patient care and outcomes by creating and leveraging the right quality improvement culture and tools, nurses' education, and training in the overall care process.

IMPLICATIONS OF FINDINGS

The findings from this study lead to several implications for nursing management, practice, education, and research to close the gap between research findings and nursing practice. Hospitals and nurse managers have to cooperatively plan for conducting Unit-based as well as Hospital-based training programs on QI and EBP. Developing proper comprehensive training programs to help nurses become familiar with EBP language develops online searching skills and EBP steps and competencies to facilitate the smooth implementation of EBP. In designing and implementing such educational programs, individual characteristics of nurses, as well as nurses' work schedules and time, should be considered. It would be of optimal benefit for educational sessions to be held onsite, close to work areas, and of short duration to allow nurses participation and benefits with the coordination of units' nurse managers. Gradual training of nurses is recommended starting with senior and bachelor-degree nurses to be prepared as role models for other nurses to guide their practice. Equally, facilitators and barriers to EBP must be addressed within each hospital from hospital managers and quality staff so that tailored strategies to overcome these barriers can be implemented. For nursing education, evidence-based practice should be more included in the Nursing curricula. Academic staff and health care agencies should develop a comprehensive strategy for building nursing students' competencies as a future nursing workforce through cultivating an EBP learning environment.

Limitation and Implications for Future Research

Although the study findings contributed to the current knowledge about EBP and QI among Egyptian nurses, the results of this study should be viewed cautiously, considering it

has some limitations. Future research might address these limitations. First, this study was based on self-reported data from one culture, which may represent an inherent bias. It is recommended to explore the relationships between EBP and QI using different methodologies, such as knowledge assessment tests and observation-based performance testing, while including more nurses in more varied healthcare settings and cultures for generalization. Second, the study focused on individual characteristics associated with the perception of EBP and QI and did not include organizational factors, such as nursing leadership and organizational culture. Therefore, future studies are recommended to include these variables.

LIST OF ABBREVIATIONS

EBP	=	Evidence-Based Practice
QI	=	Quality Improvement
EKB	=	Egyptian Knowledge Bank

ETHICS APPROVAL AND CONSENT TO PARTICIPATE

Approval was received from the Faculty of Nursing, University of Alexandria, Saudi Arabia. The researchers clarified to all participants the purpose of the study

HUMAN AND ANIMAL RIGHTS

Not applicable.

CONSENT FOR PUBLICATION

Informed consent was obtained from all participants.

AVAILABILITY OF DATA AND MATERIAL

The data supporting the findings of the article is available from the corresponding author [A.H] on reasonable request.

FUNDING

CONFLICTS OF INTEREST

The authors declare no conflict of interest, financial or otherwise.

ACKNOWLEDGEMENTS

SUPPLEMENTARY MATERIAL

Supplementary material is available on the publisher's website along with the published article.

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